

# Bedding the pipeline zone

FBS

## Creation of lower and upper bedding layer according to planning and static proof



For suitable equipment for compaction, see table on reverse „Permissible compaction equipment“.

### Standard design according to DIN EN 1610 (bedding type 1) and DWA-A 139

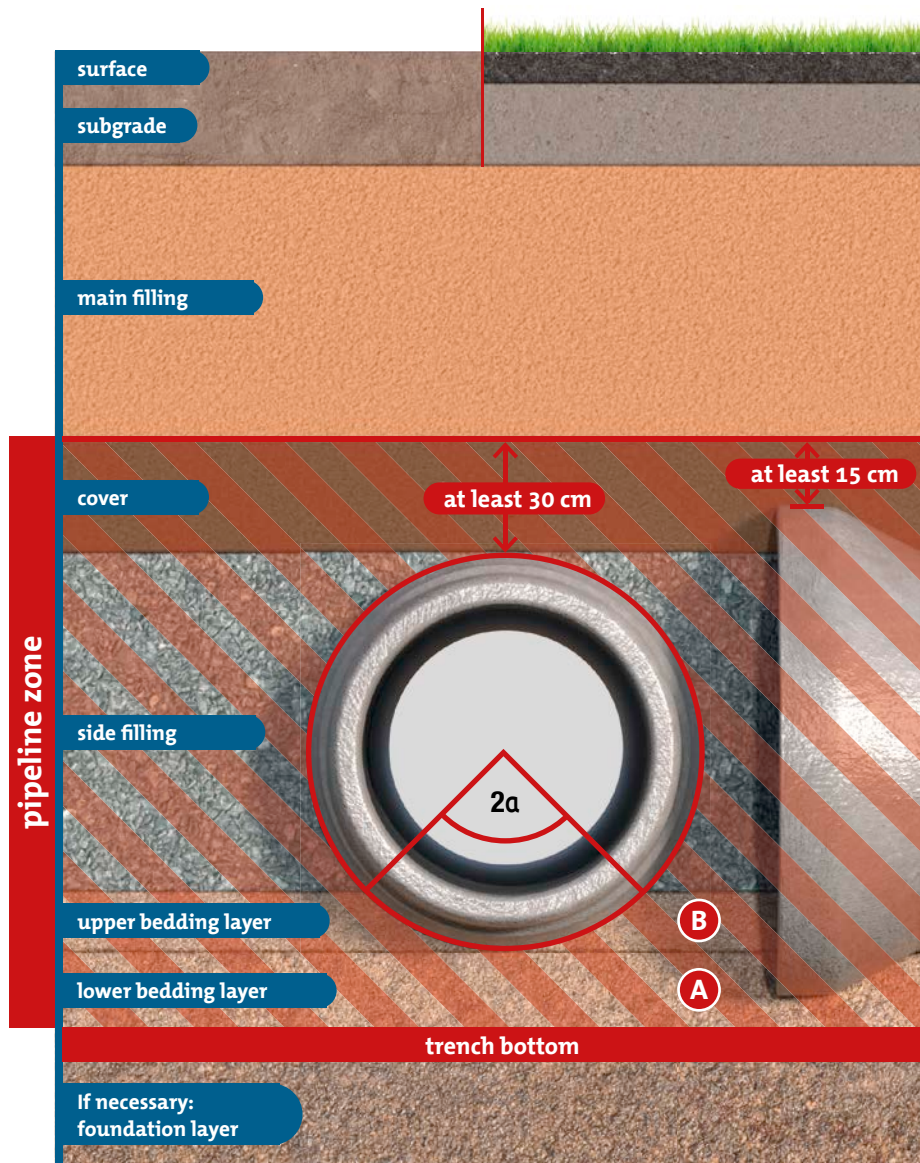
Bedding with a **lower bedding layer A** of at least 100 mm + 1/10 DN in normal soil conditions and of 100 mm + 1/5 DN for hard subsoil. **Upper bedding layer B** of at least 0.15 x OD (outside diameter) at 2 alpha (α) = 90° (according to static proof).

### Compacting the bedding layers and ensuring uniform pressure distribution

The lower bedding layer **A** should be composed of compactable material and compacted in such a way that the bearing safety of the pipe is ensured. Install upper bedding layer **B** with the same material as lower bedding layer **A**. Use suitable bedding material in accordance with the invitation to tender and static proof on both sides and recompact manually in the gusset area. **In the case of type 1 bedding, the lower bedding layer A must not be compacted more than the upper bedding layer B.** Linear and point bearings must always be avoided. In the case of a concrete bedding, side filling must not be started until the concrete has reached a sufficient load-bearing capacity.

### Side filling and covering

Place suitable backfill material on both sides of the pipeline evenly and compact alternately in layers in accordance with the table „Permissible compacting equipment“ on the reverse side and the static proof. Backfill material, backfill height and compaction equipment must be matched to each other. The subsequent compaction must be continuously checked (reference value: 97% Proctor density). Compaction in the pipeline zone is of decisive importance for the stability of the pipeline. **Observe the requirements of DWA-A 139! Minimum working space must be maintained on both sides of the pipe!** The area of the cover (from the crown of the pipe to at least 30 cm above the pipe or 15 cm above the bell) may only be compacted manually or with a light vibrating tamper (<30 kg). **This area cannot be driven over!** The main filling takes place above this.



## Permissible compaction equipment

Notes on suitability: + recommended; ○ mostly suitable, must be adapted to the individual case; - not suitable

Type of equipment		Compaction classes								
Service weight [kg] or width [m] and centrifugal force [kN].		V1			V2			V3		
		Abbreviation according to DIN 18196 GW, GI, GE, SW, SI, SE, GU, GT, SU, ST			Abbreviation according to DIN 18196 GU*, GT*, SU*, ST*			Abbreviation according to DIN 18196 UL, UM, TL, TM, TA <sup>1)</sup>		
		Suitability	filling height	Number of passes/ operating time [s]	Suitability	filling height	Number of passes/ operating time [s]	Suitability	filling height	Number of passes/ operating time [s]
<b>1. Compaction equipment (pipe zone and up to 1 m <sup>2)</sup> above the pipe crown)</b>										
Vibrating tamper	light	bis 30 kg	+	< 20	2 - 4	+	< 20	2 - 4	-	-
	medium	30 - 60 kg	○	20 - 40	2 - 4	○	20 - 30	3 - 4	-	-
	heavy	60 - 100 kg	○	30 - 50	2 - 4	○	20 - 40	3 - 4	-	-
Surface vibrators	light	bis 100 kg	+	< 20	3 - 5	+	< 15	4 - 6	-	-
	medium	100 - 300 kg	○	20 - 30	3 - 5	○	15 - 25	4 - 6	-	-
Add-on compactors <sup>3)</sup>	small	< 0.40 m < 25 kN	+	20 - 40	5 - 12 (sec)	+	30 - 40	5 - 12 (sec)	-	-
<b>2. Compaction equipment (from 1 m <sup>2)</sup> above the pipe crown)</b>										
Vibrating tamper	medium	30 - 60 kg	+	20 - 40	2 - 4	+	20 - 30	2 - 4	○	10 - 30
	heavy	60 - 100 kg	+	30 - 50	2 - 4	+	20 - 40	2 - 4	○	20 - 30
Surface vibrators	medium	100 - 300 kg	+	20 - 40	3 - 5	○	20 - 40	3 - 5	-	-
	heavy	300 - 750 kg	+	30 - 60	3 - 5	○	30 - 50	3 - 5	-	-
Vibrating rollers	heavy	600 - 8.000 kg	+	30 - 80	4 - 6	+	30 - 60	4 - 6	○	30 - 60
Add-on compactors	medium	0,40 m - 0,75 m 25 kN - 75 kN	+	30 - 75	5 - 12 (sec)	+	30 - 70	5 - 12 (sec)	○	30 - 70
	heavy	> 0,75 m > 75 kN	+	50 - 100	5 - 12 (sec)	+	50 - 100	5 - 12 (sec)	+	50 - 100

1) not suitable for backfilling in road areas 2) in compacted condition 3) manual gusset compaction

Source: Work report of the project group „Add-on compactors“ of the DWA working group ES-5.1, published in KA - Korrespondenz Abwasser Abfall, Jg. 66, Nr. 4, 2019



**Fachvereinigung  
Betonrohre und  
Stahlbetonrohre e.V.**

**Fachvereinigung Betonrohre  
und Stahlbetonrohre e.V. (FBS)**

Schloßallee 10 // 53179 Bonn

Phone +49 (0)-228-954 56 54

Fax +49 (0)-228-954 56 43

E-Mail [info@fbsrohre.de](mailto:info@fbsrohre.de)

[fbsrohre.de](http://fbsrohre.de)



/fachvereinigung-betonrohre-und-stahlbetonrohre



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/fbsrohre



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**Leak test:** Please observe FBS  
guideline issue 2022!



### Notes on leakage testing

Wastewater pipes, sewers and manholes must be checked for leaks in accordance with DIN EN 1610 and worksheet DWA-A 139 after backfilling the pipe trench, removing the shoring and, if necessary, paving the surface.

# Installation instructions

## Professional installation of circular concrete & reinforced concrete FBS pipes



For detailed information on  
installation, please visit

[fbsrohre.de/infohub](http://fbsrohre.de/infohub)

Version: December 2022



Video instruction  
installation of FBS pipes



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## Delivery and inspection

### 1.1 Unloading procedure

Visually **inspect** components before unloading. Use only hoists with fine lift, components must not be subjected to impact stresses, dropped, rolled or dragged on the ground.

**Observe work safety regulations!**

### 1.2 Storage on site

Proper storage of components at least 0.60 m from the edge of the trench or embankment. Secure pipe stacks with squared lumber or similar to prevent them from rolling apart.

### 1.3 Fine check

Before signing the delivery bill, it is essential to check:

- Number, completeness and dimensions of pipes and accessories
- Marking (e.g., diameter (DN) and length, manufacturer, manufacturing plant, DIN, FBS marking, concrete / reinforced concrete, special reinforcement, etc.)

Obvious defects (e.g., cracks > 0.2 mm, spalling, damaged seals) must be noted on the delivery note and logged as a complaint. **Later notifications of defects will not be accepted!**

## Dimensioning the minimum trench width

depending on the nominal width (DN) of the pipe

Nominal width of pipe (DN)	Minimum shored trench width	Minimum unshored trench width	
		$\beta > 60^\circ$	$\beta \leq 60^\circ$
> 225 mm to $\leq$ 350 mm	$OD_h + 0.50$ m	$OD_h + 0.50$ m	$OD_h + 0.40$ m
> 350 mm to $\leq$ 700 mm	$OD_h + 0.70$ m	$OD_h + 0.70$ m	$OD_h + 0.40$ m
> 700 mm to $\leq$ 1.200 mm	$OD_h + 0.85$ m	$OD_h + 0.85$ m	$OD_h + 0.40$ m
> 1.200 mm	$OD_h + 1.00$ m	$OD_h + 1.00$ m	$OD_h + 0.40$ m

**ATTENTION:** The larger value of both tables is relevant!  $OD_h$ : Horizontal outer diameter in m.  $\beta$ : Angle of slope of the unshored trench.

## Excavation and construction of the pipe trench

### 2.1 Excavation of the pipe trench

Stake out the pipeline route and excavate the trench in accordance with the invitation to tender, DIN EN 1610 and, if necessary, worksheet DWA-A 139. Minimum trench width according to DIN EN 1610. Observe embankment angle for unobstructed trenches. **Please refer to the table at the bottom left!** Store excavated material at least 0.60 m from the edge of trench (danger of collapse!), remove soil that cannot be compacted. **Trench and sheeting must comply with the specifications of the static proof and the accident prevention regulations.**

### 2.2 Securing the excavation pit

The excavation pit must be secured in accordance with the accident prevention regulations (e.g., preventing persons and objects from falling in).

### 2.3 Create trench bottom

Create trench bottom according to plan specifications (slope) and keep free of water and frost during installation. If the soil is suitable, the bottom of the trench can serve as a bedding (observe the invitation to tender). **Unsuitable soil is to be replaced! Bedding layer as standard condition: see fold-in!**

### 2.4 Preparing the connection area

In the case of pipes with a bell sleeve, hollows/sleeve holes must be excavated in the bottom bedding in the connection area in order to avoid point bearing in the area of the bell sleeve and dislocation of the bedding material, which can lead to leakage.

## Installation of the pipes

### 3.1 Condition check

Check for proper condition and clean, functional seals and sealing surfaces in the sleeve and at the spigot end. Any dirt in the sealing area must be removed.

### 3.2 Transport/Installation

Transport and insert the pipes and fittings into the trench: ropes, straps, transport anchors, C-hooks, pipe grabs, etc. are permitted. **Observe safety instructions under 1.1!**

### 3.3 Applying the lubricant

Apply lubricant generously (at least 2 mm thick) to both sides of the pipes (lubricant path on sleeve and spigot end). Only use lubricants approved by the manufacturers, as seal and lubricant are matched to each other. **Apply the lubricant only with gloves, not any sort of brush!**

### 3.4 Inserting butt joint limiters

A butt joint gap must be maintained between the FBS pipes to ensure the mobility of the joint. Recommended and maximum dimensions of the joint widths as well as the number of butt joint limiters can be taken from the table below. Apply a butt joint limiter (e.g. wooden shims, approx. 5-8 mm strong) with the aid of a small amount of lubricant to the bottom of the sleeve.

Nominal width	Recommended butt joint width	Maximum butt joint width	Number of butt joint limiters
$\leq$ DN 600	5 mm	15 mm	min. 3 pieces
DN 700 to DN 1200	10 mm	20 mm	min. 4 pieces
DN 1300 to DN 1500	10 mm	25 mm	min. 4 pieces
$\geq$ DN 1600	15 mm	30 mm	min. 6 pieces

### 3.5 Connecting the pipes

The pipe to be installed is inserted freely suspended and centered into the socket of the pipe already installed and connected using approved pulling equipment, winches or presses. **Do not push together with excavator bucket!**

## Backfilling and removal of pipe trench support

Remove shoring only if it can be dispensed with by backfilling or other safety measures (DIN 4124, Chapter 8). Alternately, pull out shoring approx. 0.5 m in steps, immediately followed by recompaction. The compaction of the backfill material must result in sufficiently good interlocking with the trench wall. Pulling a thick-walled shoring unit without effective recompaction leads to an uncontrolled increase in the load on the pipeline, which can result in damage.



**Note:** For the design of the pipeline zone, see fold-in page.



### Main filling

Backfill and compact the layers properly in accordance with the requirements and the static proof of the FBS pipes. **Do not compact the lower area of the main filling more than the pipe zone!**



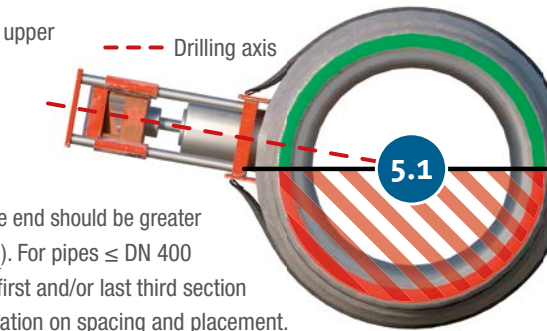
\*\* medium and large-sized add-on compactors starting from 1m above the pipe crown

## Creation of connection openings on site

On-site creation of connection openings to FBS pipes may only be done with a suitable core drilling equipment. The drilling equipment must be fixed to ensure correct drilling. For this purpose, it must be fixed by means of belts, vacuum plates or similar. **The drilling equipment must not be anchored to FBS pipes.**

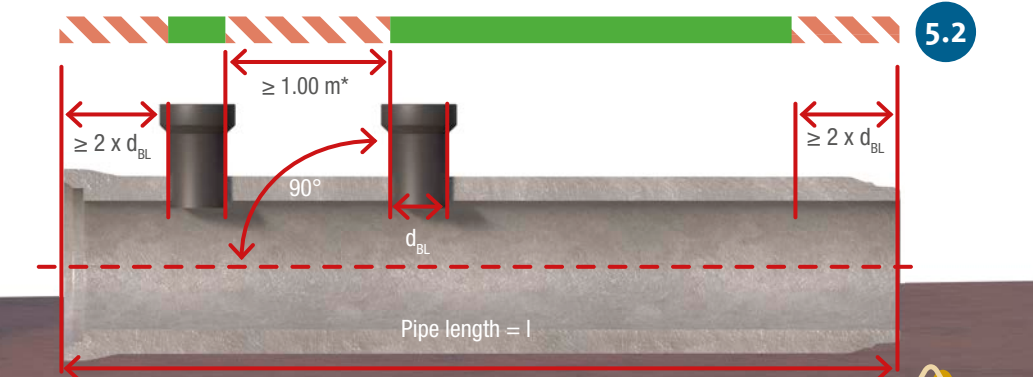
### 5.1 Arrangement of the boreholes

The inlet connection should only be made in the upper half of the pipe circumference perpendicular to the center of the pipe. **Observe the slope of the connecting pipe!**



### 5.2 Spacing of the boreholes

The distance between the connection and the pipe end should be greater than twice the diameter of the borehole ( $\geq 2 \times d_{BL}$ ). For pipes  $\leq$  DN 400 and length  $\geq$  2.5 m arrange the borehole in the first and/or last third section of the pipe. See drawing 5.2 for our recommendation on spacing and placement.



\* Distance between boreholes, shortest distance along the circumference of the pipe  
Legend:  $d_{BL}$  = Borehole diameter

## ATTENTION

Abrupt filling of large amounts of backfill or the use of drop weights for compaction, driving over the backfilled pipeline with construction vehicles and/or heavy construction equipment when the overburden is low, and storing excavated soil above the pipeline are not permitted. **Medium and heavy compaction equipment may only be used from a cover height of at least 1.00 m (measured above the outer pipe crown after compaction).**