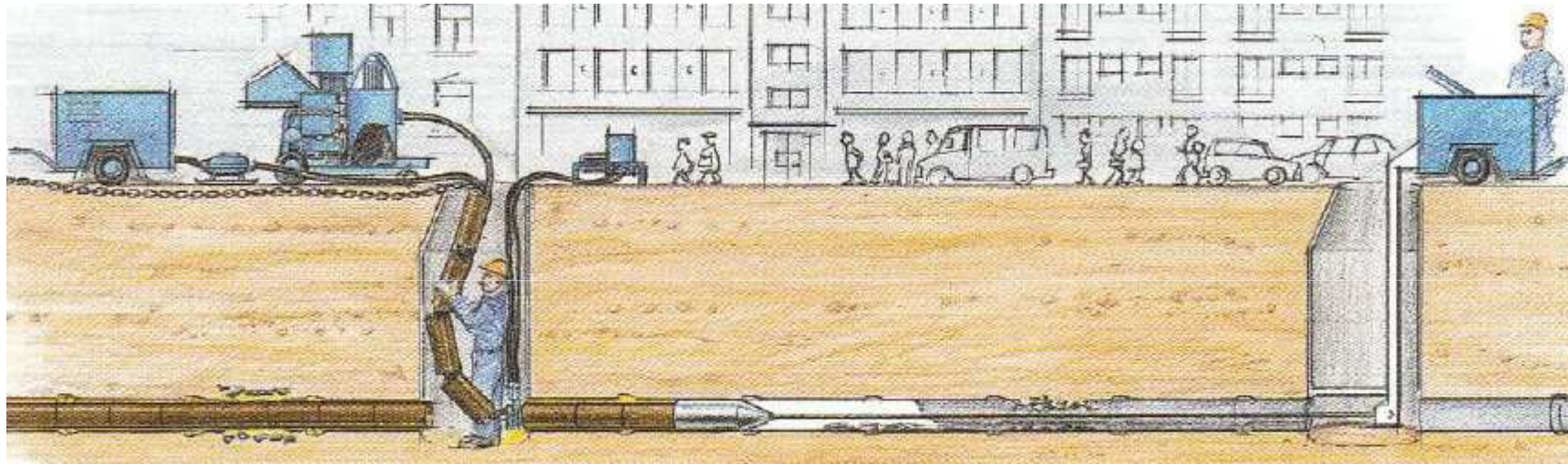


# Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes



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President - **GSTT** German Society for Trenchless Technologies

speaks on behalf of

beton & rohrbau C.-F. Thymian GmbH & Co. KG

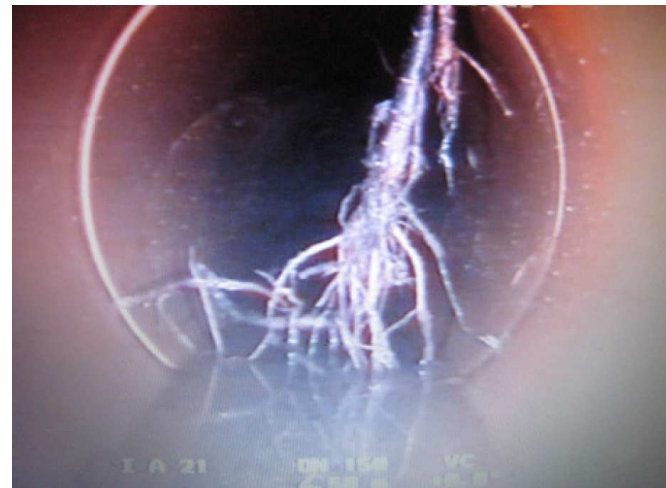


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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

The sewerage network in the Kingdom of Bahrain, consists in many parts of Bahrain of vitrified clay pipes (VCP).

A CCTV investigation was carried out to inspect the condition of the existing main sewer system. Some parts of the surveyed sewerage pipes were considered damaged with various cracks and root penetrations.



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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

The damage and high groundwater levels cause heavy infiltration rates and higher amounts of wastewater to be treated.



Rehabilitation of the existing sewerage pipe system is therefore recommended.

Regarding the lifetime of the different rehabilitation methods and to increase the sustainability of the rehabilitations the calibrated burst lining method is a very interesting and economical alternative.



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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

The calibrated burst lining method is used to **dynamically or statically widen** individual locally limited damage in the sewers.

For the specific situation at the first Project with

- relatively short restraining lengths,
- relatively low pipe diameters and
- with regard to as short a construction period as possible,

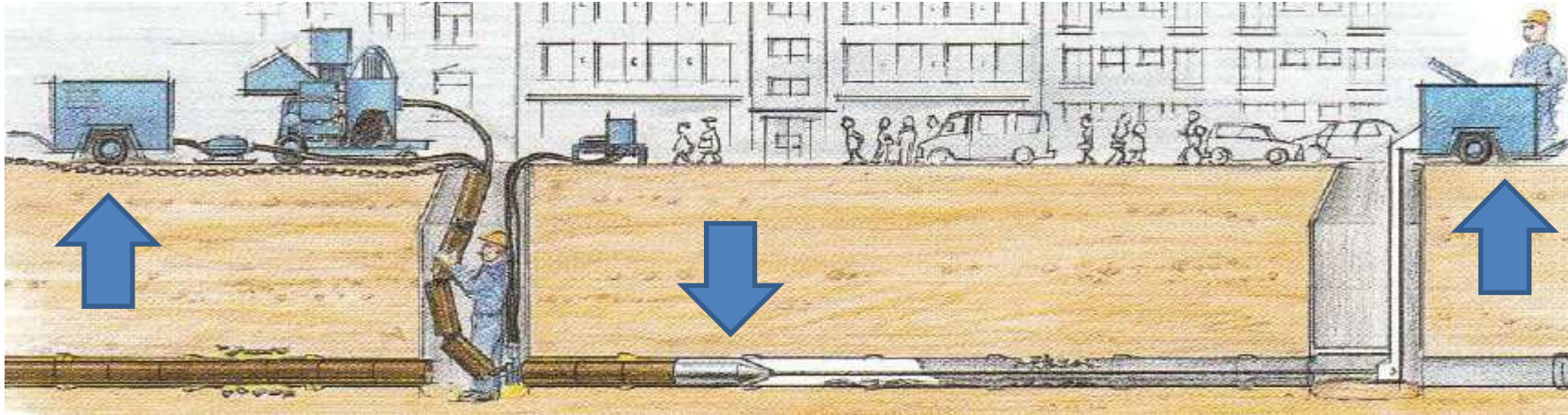
Beton & Rohrbau applied the dynamic calibrated burst lining method for the rehabilitation of 2.900 meter clay pipes with diameters ranging from 150 to 250 mm



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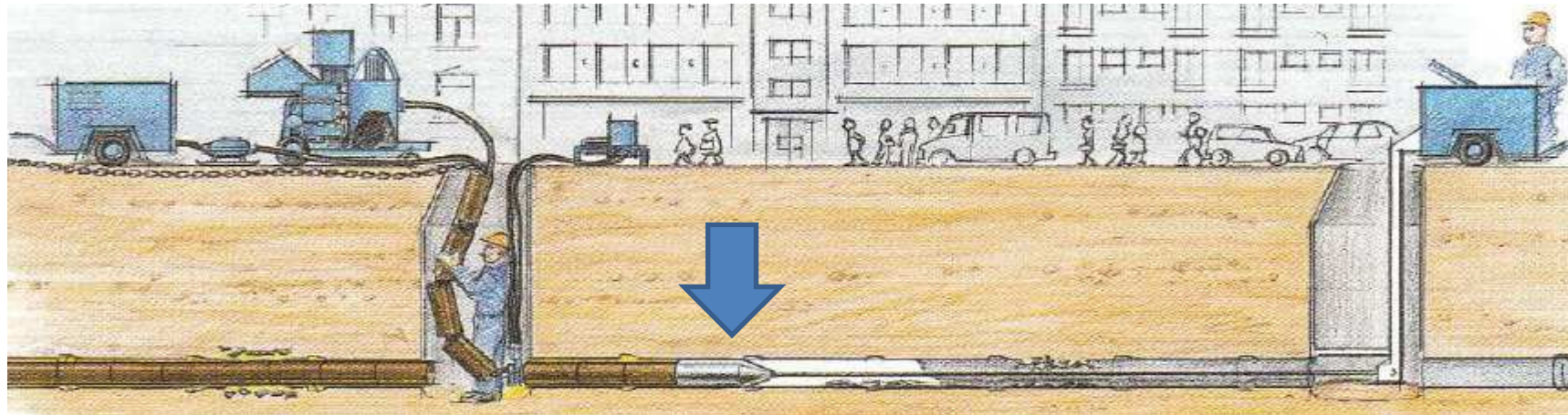


## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes



In the dynamic burst lining method, the tensile force of a **rope winch** supports the bursting and drawing in process. A **compressed air operated bursting hammer** was used as displacement body which was **driven by a compressor**. The bursting tools transmit the hammering energy to the old pipeline and widen it, if necessary. The burst old pipeline was displaced into the surrounding ground and the cross-section

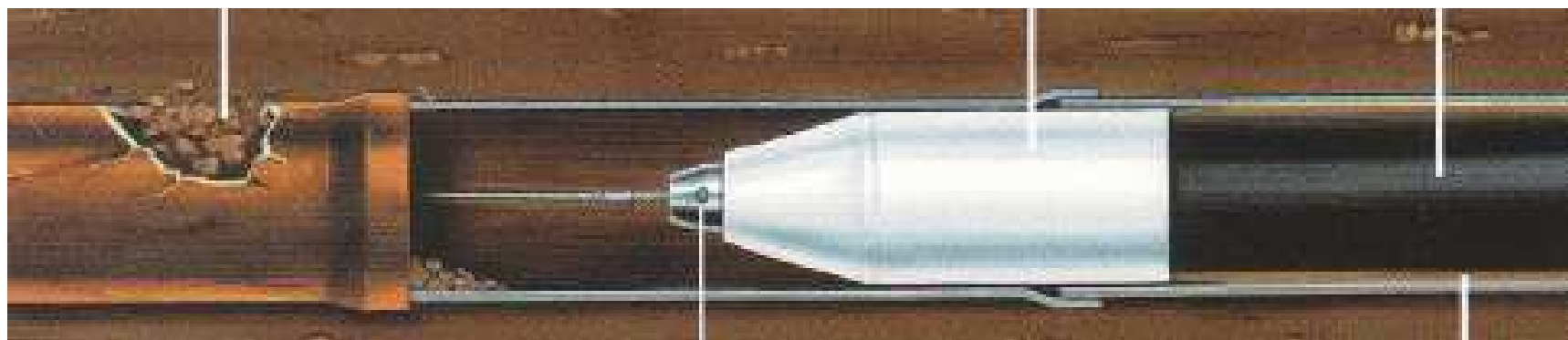
## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes



damaged old pipe  
cracks, root penetration etc.

calibration head

PP short pipe



bursting hammer

close fit / tight in Pipe

## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

The dynamic bursting head was used only if, for instance, local deformations, cracks, offsets and partial collapse were found.

Progress of work was considerably higher because the bursting hammer had to carry out its break down and displacement work only at the point of damage while the pipe was drawn in at the remaining restraining length as with the lining method.



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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes



Installation length: 946 mm

Diameter: 130/145 mm

Weight: 60 Kg

Number of blows: 580 (min-1)

Air consumption: 1.7 m<sup>3</sup>/min

Tracto Technik Germany



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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

**The process of burst lining works as follows:**

The existing benches of the manholes must be chiseled off partly.

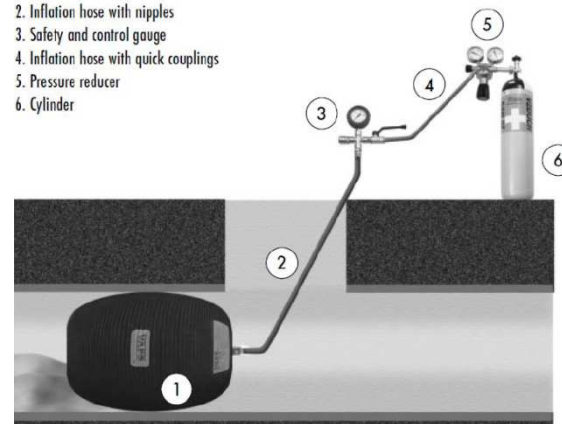


## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

### - Installation bypass sewage

The wastewater will be stopped with rehabilitation packers ( **pipe stoppers** ) in the manhole **before the first draw in shaft**. Than a **wastewater pump** will be **installed in the shaft**. The fully automatic operating pump will be **connected with flexible high-pressure wastewater hoses** to deliver the wastewater to the next sewer at a lower level.

1. Pipe stopper
2. Inflation hose with nipples
3. Safety and control gauge
4. Inflation hose with quick couplings
5. Pressure reducer
6. Cylinder



## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

### - Execution calibrated burst lining

The **rope winch will be positioned** at the winch shaft, the compressor and the bursting head at the draw-in shaft. The rope of the winch will be drawn into the old pipeline by means of a fiber glass rod.



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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes



rope winch at the winch shaft

adjustable depth boom





## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

The new pipes will be laid down outside of the draw-in shaft, the compressed air hose and a holding chain will be threaded through the pipes. After connection of the bursting hammer the latter will be lowered into the shaft by means of the rope fastened at its head and drawn into the old pipe .



## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

After moving in of the bursting hammer, the **short pipes are lowered individually into the shaft, connected with the last pipe and guyed by the holding rope**. Then the bursting process can be started, if necessary, by starting the compressor. The forward movement and direction stability are supported by the tensile forces applied by the rope winch.

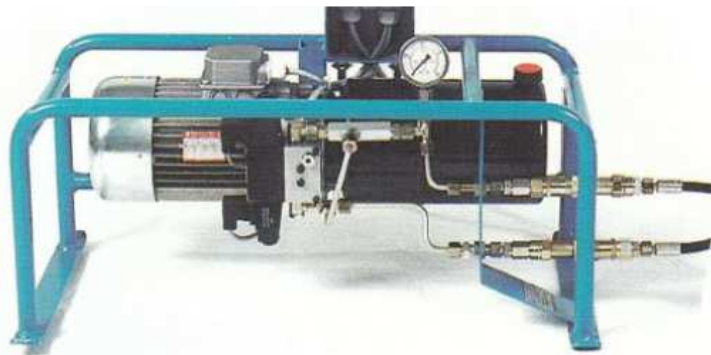


## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

The short pipes are connected in the draw-in shaft with a hydraulically driven stretch unit to form a continuous pipe string with a chain connection to transfer tension to the bursting machine. This compact construction allows it to be used in small manholes.



Stretch unit

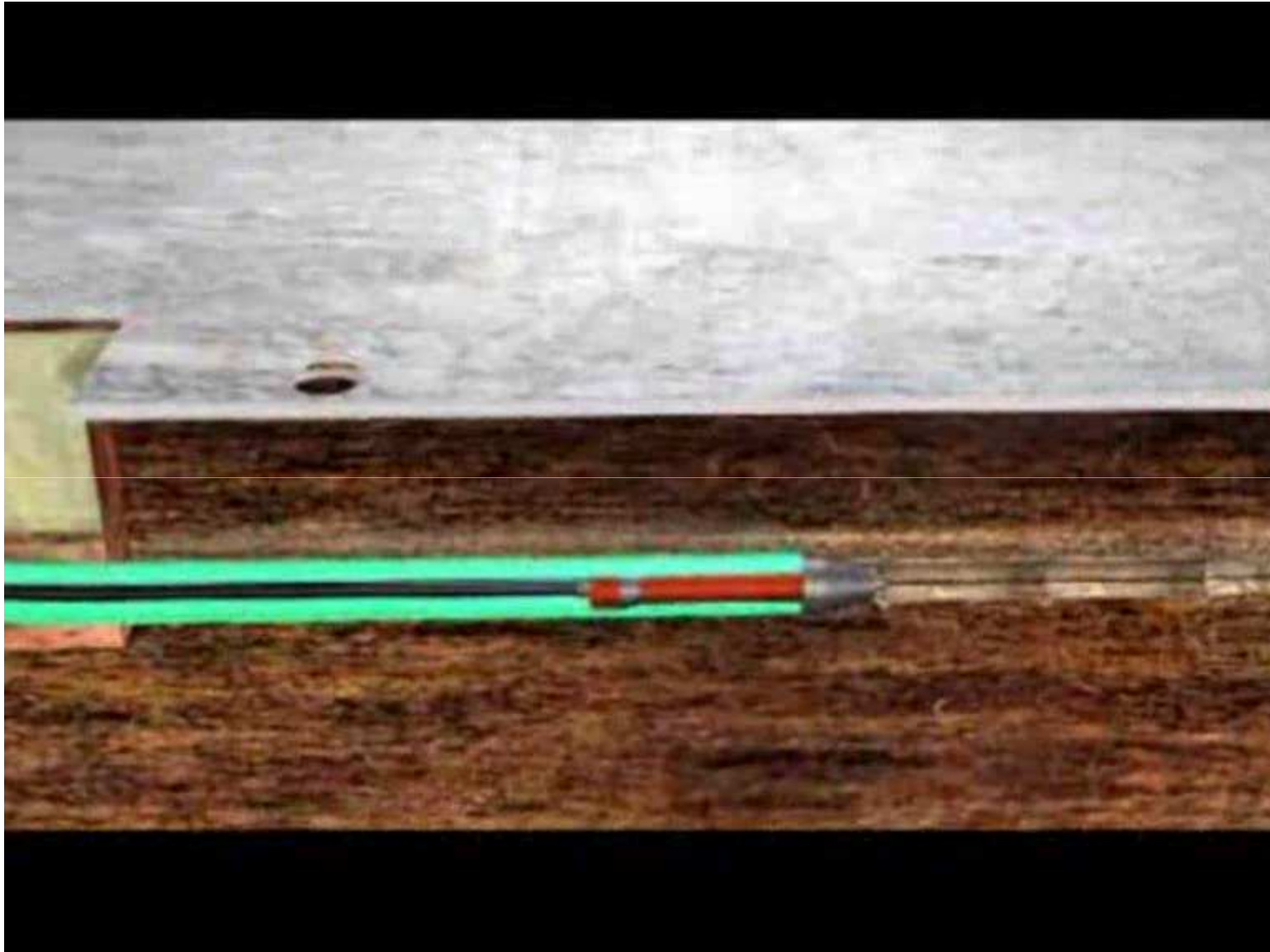


hydraulic unit



insert adapter for short pipes





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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

Beton & Rohrbau selected a special **drive pipe made of polypropylene HM** for sewer systems with a higher e-module . The short pipes from the manufacturer Schoengen / Germany have a **special tensile strength multiple grid type connection**.



## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

In addition the pipes have following features:

- root resistance connection
- high impact resistance
- high rigidity and surface hardness
- environmentally friendly and recyclable
- resistance to conventional wastewater (pH 2 – pH 12)
- temperature area of application - 20°C up to + 90°C



## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

### Pipe dimensions for the calibrated burstlining project:

Old pipe diameter 150 mm: Short Pipe, PP – HM material 144 x 12 mm

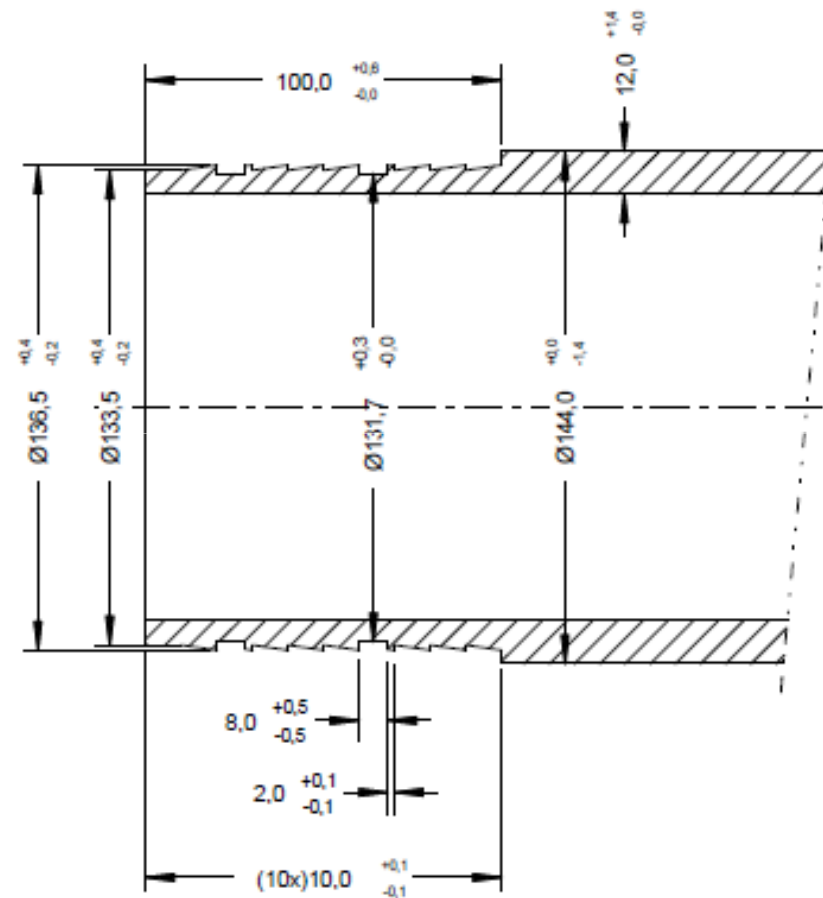
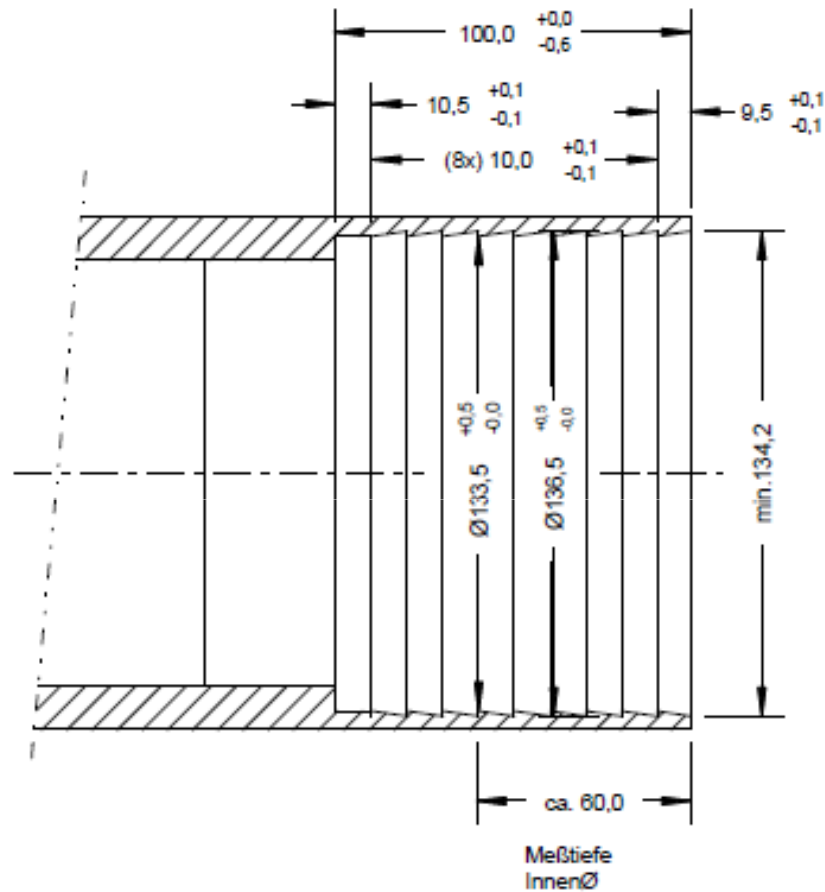
Old pipe diameter 200 mm: Short Pipe, PP – HM material 192 x 12 mm

Old pipe diameter 250 mm: Short Pipe, PP – HM material 242 x 13 mm



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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes





## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

outer diameter	wall-thickness	weight per meter		1,00 m construction length		0,47 m construction length
[mm]	[mm]	[kg]	[€ /m]	Artikel-Nr.	[€ /m]	Artikel-Nr.
110	6,2	1,98		VB11001L		VB11047K
140	6,7	2,73		VB14001L		VB14047K
*144	12,0	4,79		VB14401L		VB14447K
160	7,4	3,45		VB16001L		VB16047K
170	12,0	5,74		VB17001L		VB17047K
180	15,0	7,48		VB18001L		VB18047K
*192	12,0	6,55		VB19201L		VB19247K
220	12,8	8,04		VB22001L		VB22047K
225	15,0	9,53		VB22501L		VB22547K
*242	13,0	9,02		VB24201L		VB24247K
280	18,0	14,25		VB28001L		VB28047K
*292	13,0	11,00		VB29201L		VB29247K
330	18,5	17,45		VB33001L		VB33047K
*340	15,0	14,77		VB34001L		VB34047K
380	20,0	21,77		VB38001L		VB38047K
*392	18,0	20,37		VB39201L		VB39247K
450	25,0	32,09		VB45001L		VB45047K
*485	22,5	31,49		VB48501L		VB48547K
560	30,0	48,00		VB56001L		VB56047K
630	35,7	63,70		VB63001L		VB63047K

\* customised length are available on request



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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

After the rehabilitation works the new short pipes were cut and watertight embedded at the existing start and receiving manholes. Therefore a flexible, 2- component sealant were used to seal the annular space between the old and the new pipe. It combines excellent hardness with good flexibility resulting in a permanent, maintenance free installation.



## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

After the watertight embedding of the new pipes the **manhole benchings have been**, according to the standard drawings for manholes type E + F of the Ministry of Works, **repaired with concrete C45/20**. They have been **finished with epoxy mortar protection**



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## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

For the post contract phase in the rehabilitation concept the time need was estimated for:

Construction and commissioning 5 - 6 months

Through the optimization of the construction course Beton & Rohrbau needed for the rehabilitation with the calibrating burst lining method for 2.890 meter with 75 manholes only 3,5 months and 0,5 months for commissioning.

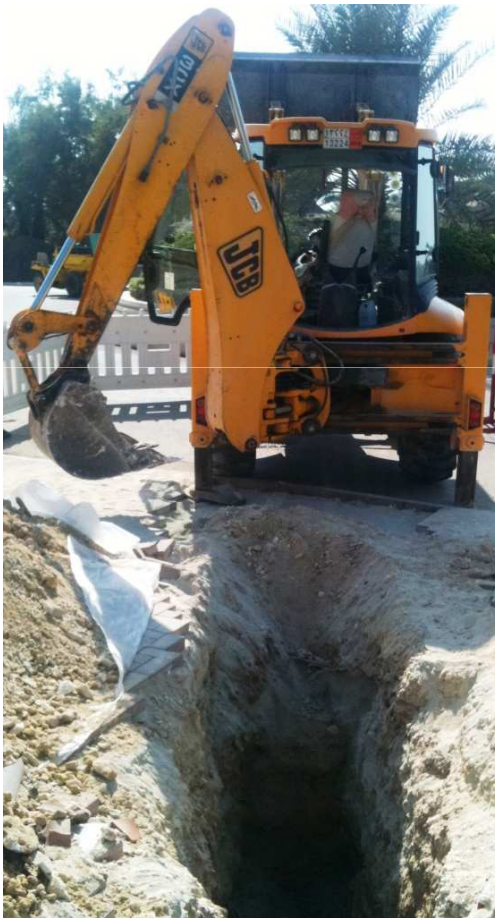
Only at two points it was not possible to work trenchless:





## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

Only at two points it was not possible to work trenchless:



Roots with Ø 90 mm in the old pipe



## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

No problem for trenchless technologies:  
Roots milled by robot technique





## Rehabilitation of Sewerage Network on the example of Calibrated Burstlining with short pipes

Only at two points it was not possible to work trenchless:



bend with 45°

Rehabilitation of Sewerage Network on the example of Calibrated  
Burstlining with short pipes

شكراً جزيلاً لحسن إنتباهكم !

Thank you for your attention !

...and we hope to see you in Berlin to the



29<sup>th</sup> INTERNATIONAL NO DIG  
Conference and Exhibition

Berlin Exhibition Grounds  
2 - 5 May 2011

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