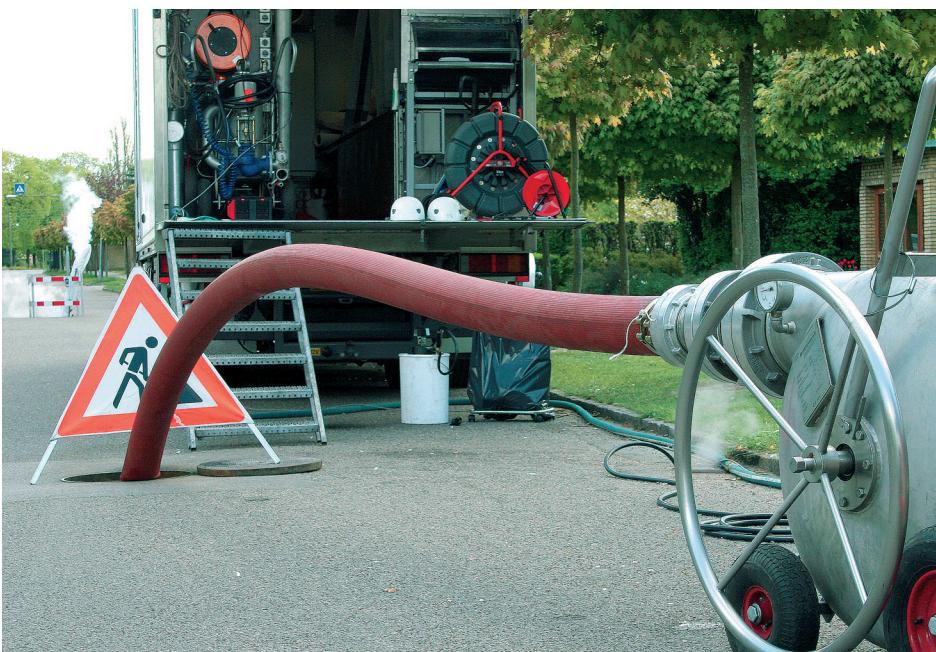


Methods for renewal of laterals



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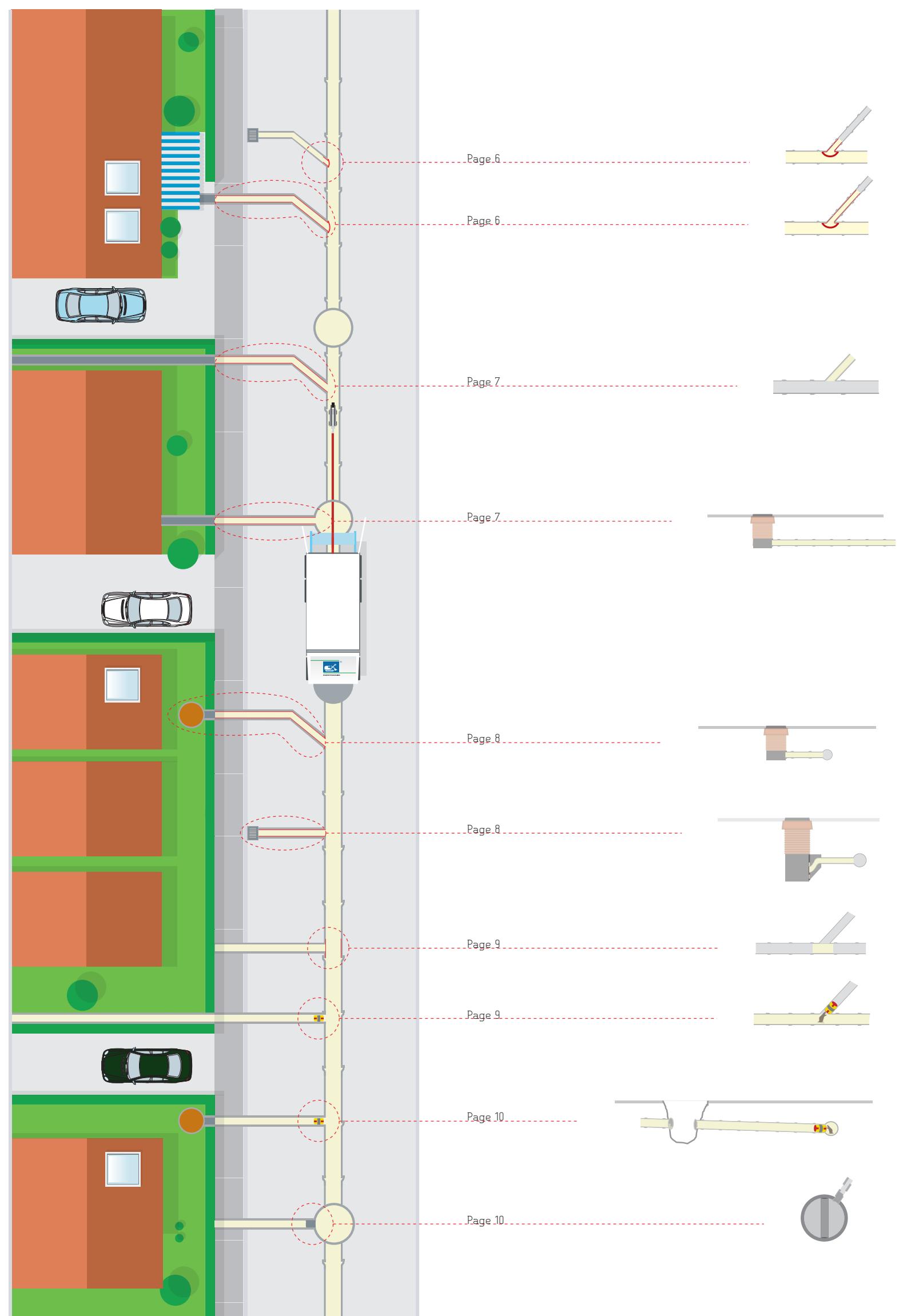


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Introduction

In recent years, we have experienced a growth in the development of methods for No-Dig renewal, flushing and CCTV inspection of laterals – all carried out from the main pipe. These methods mean minimum inconvenience to residents, business owners and traffic. Furthermore, No-Dig methods present a cost advantage compared to conventional excavation. The CIPP Lining methods described in the following cause a minor reduction of the pipe's cross section.

Other methods, such as sliplining of small dimension pipes, cause an unacceptable reduction of the pipe's cross section.

This brochure describes different methods for renewal of laterals. For a further specification of the priorities and criteria for selecting a renewal method, refer to the brochure "Criteria and priorities for renewal of laterals".

Aarsleff Hat Profile



Renewal with Aarsleff CIPP Lining

Aarsleff CIPP Lining is an effective solution for No-Dig renewal of horizontal as well as vertical pipes.

Aarsleff CIPP Lining is made of an acid-proof polyester fibre impregnated with resin and inverted into the existing pipe. CIPP Linings are carried out in all pipes with cross section dimensions ranging from 60 mm to 2200 mm. The length of the CIPP Lining depends on the specific project.

Curing of the CIPP Lining is carried out with steam, hot water, UV light or LED.

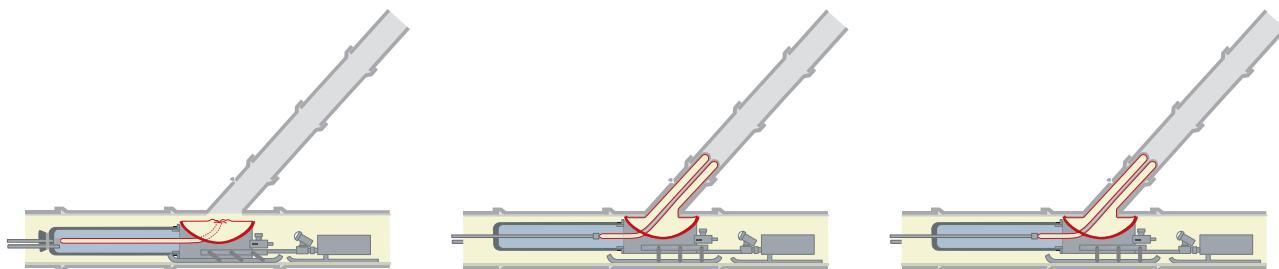
Control Scheme for Pipeline Rehabilitation

Aarsleff CIPP Lining of main pipes and laterals is admitted to the Control Scheme for Pipeline Rehabilitation. This is also the case of the Aarsleff Hat Profile.

Lateral connection collar

Aarsleff Hat Profile is more than just a lateral connection collar sealing the connection between the lateral and the main pipe. Even the short hat profiles are of such a length that they pass the first connection on the lateral. In general, hat profiles are only installed in relined pipes. Hat profiles can be installed in pipes made of concrete, clay or plastic, but adhesion to the surface of the existing pipe cannot be guaranteed. Aarsleff Hat Profile is admitted to the Control Scheme for Pipeline Rehabilitation. The admission covers only the actual lateral connection collar. Admission of the long hat profile covers two systems: the hat profile as well as the CIPP Lining of the lateral.

Short Aarsleff Hat Profile from main pipe



The short Aarsleff Hat Profile is a tight lateral connection collar made of acid-proof polyester fibre. A short hat profile consists of a rim of collar and an endless extension of collar. The hat profile is always tailor-made for the specific project on the site, where it is also impregnated with resin.

For installation, a short hat profile is fitted to a tool, and monitored by a CCTV camera it is pulled forward to the lateral in question. When the tool is in posi-

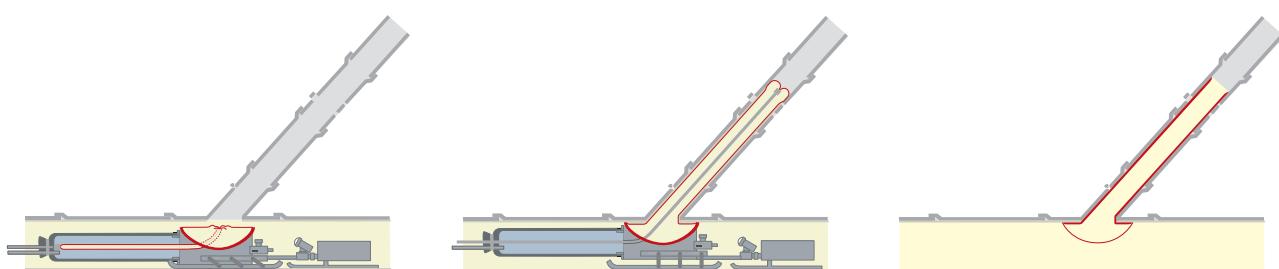
tion, the rim of collar is pressed into place whereupon the extension of collar is pushed into the lateral. Subsequently, the hat profile is cured and the tool is retracted. As the lateral is not renewed, this method is used for providing a tight transition between the main pipe and the lateral.

The length of a short hat profile is at least 30 cm and past the first joint of the lateral.

Aarsleff Hat Profile provides a tight transition between main pipe and lateral.

Aarsleff Hat Profile is admitted to the Danish Control Scheme for Pipeline Rehabilitation.

Long Aarsleff Hat Profile from main pipe into lateral

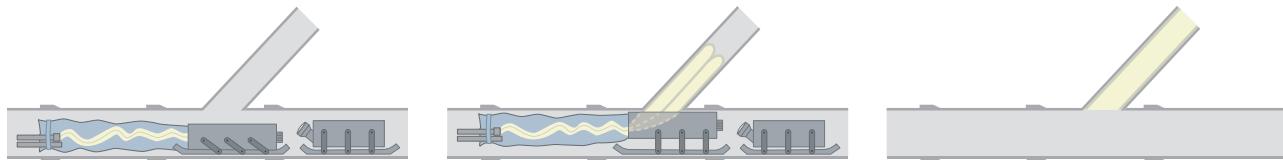


The long Aarsleff Hat Profile is installed in the same way as the short Aarsleff Hat Profile, with the sole difference that the lateral is relined all the way to the

manhole or the water trap of a road shaft. CIPP Lining is made with a liner of acid-proof polyester fibre impregnated with resin.

Aarsleff Hat Profile and Aarsleff CIPP Lining are admitted to the Danish Control Scheme for Pipeline Rehabilitation.

CIPP Lining of lateral from main pipe into lateral



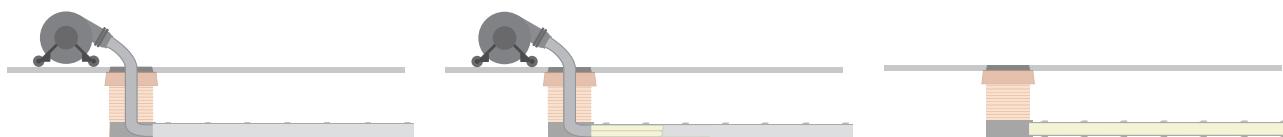
In principle, CIPP Lining of a lateral from main pipe into lateral consists of a long hat profile without a rim of collar installed in the main pipe. If this solution is chosen, no tight transition between

the main pipe and the lateral is provided. CIPP Lining can be made all the way to the water trap of the road shaft.

Aarsleff CIPP Lining is admitted to the

Danish Control Scheme for Pipeline Rehabilitation.

CIPP Lining of lateral from a manhole of the main pipe towards the boundary

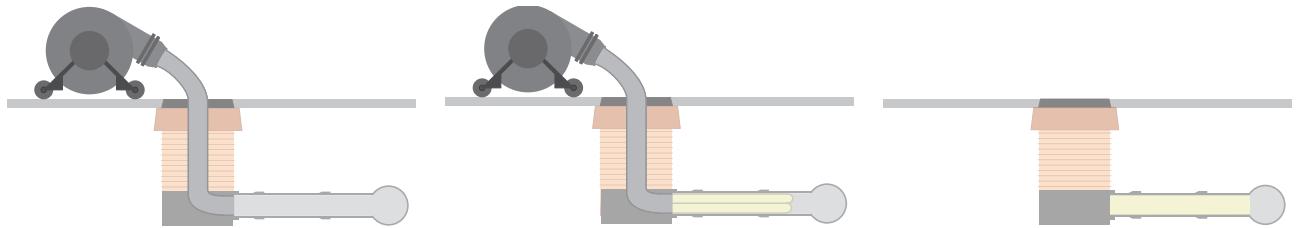


CIPP Lining of laterals from a manhole is also made with a liner of acid-proof polyester fibre impregnated with resin. CIPP Lining is made all the way to the manhole or to the water trap of a road

shaft. From the manhole, the soft liner is inverted into the defect pipe by means of air. The end of the liner is open. Subsequently, a calibration tube is inserted. The tube is closed at the end and made

of a material that does not combine chemically with the resin impregnated CIPP Lining. Subsequently, the CIPP Lining is cured and the calibration tube is retracted.

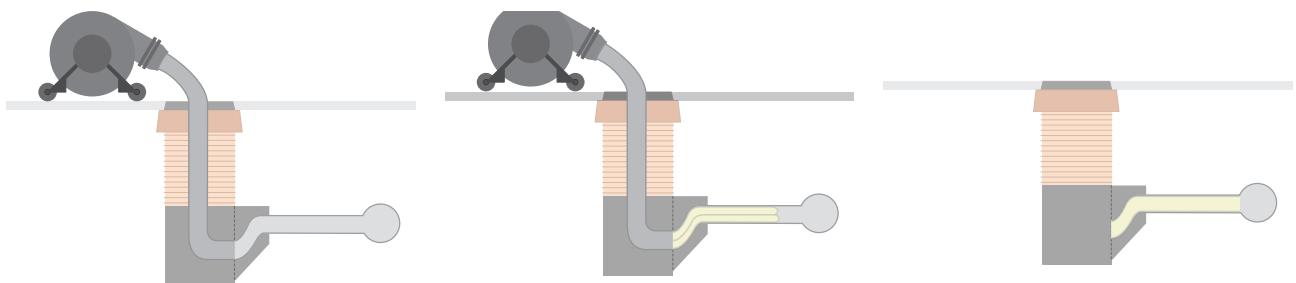
CIPP Lining of lateral from boundary manhole towards main pipe



CIPP Lining of laterals from the boundary manhole towards the main pipe is carried out in the same way as CIPP Lining from a manhole of the main pipe.

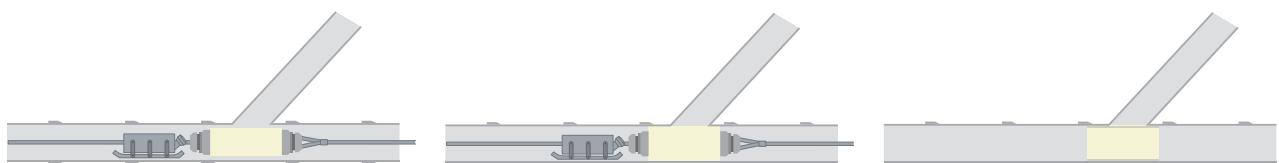
The only difference is that if the CIPP Lining is too long, the protruding end of the CIPP Lining is to be cut off in the main pipe.

CIPP Lining of lateral from roadway inlet with water trap towards main pipe



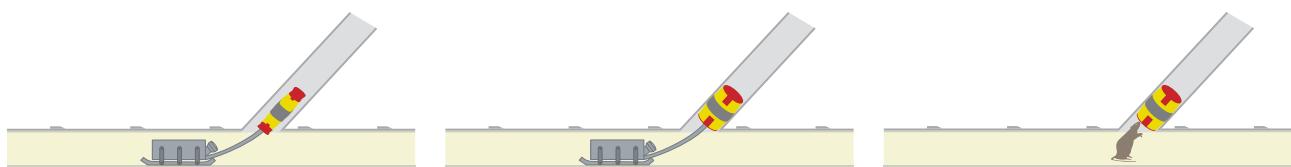
This type of CIPP Lining is carried out in the same way as CIPP Lining from a manhole. This is the latest method for CIPP Lining of laterals. The major challenge of the development work has been to invert a CIPP Lining through a water trap considering the limited space of a roadway inlet.

Spot repair



Spot repair consists of a short relining, customized for the actual job on the work site. It is made of acid-proof polyester fibre impregnated with resin.

Plugging of lateral at main pipe with Lock Pipe Grout



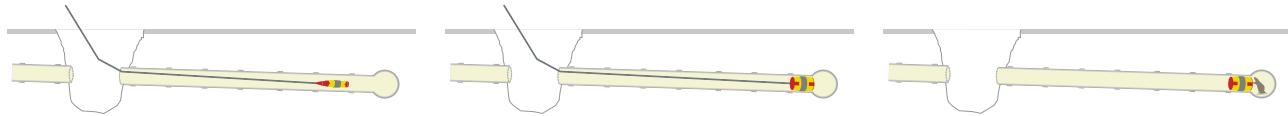
Lock Pipe Grout is the only product for plugging of laterals that holds an approval of water and sewage system by Danish authorities. Installation of Lock Pipe Grout from the main pipe provides an advantage compared to conventional installation methods, where installation takes place by means of an excavation pit, a duckfoot bend or similar.

An advantage of Lock Pipe Grout over spot repair is that the Lock Pipe Grout does not affect the hydraulics of the main pipe.

Through the manhole and the main pipe, the Lock Pipe Grout is pulled forward to the lateral in question. The Lock Pipe Grout is inserted in the lateral and filled

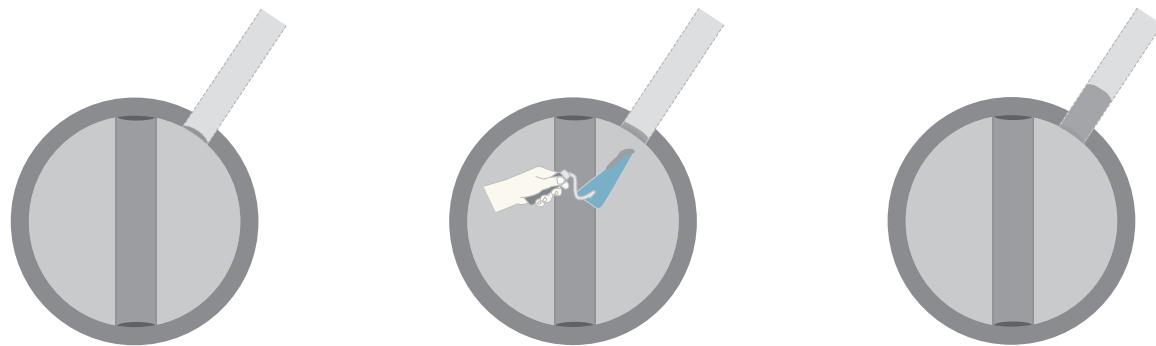
with rapid-hardening concrete. After hardening, the equipment is retracted.

Plugging of lateral at main pipe from excavation pit or boundary manhole with Lock Pipe Grout



From a boundary manhole or an excavation pit, the Lock Pipe Grout is pulled to the main pipe monitored by a CCTV camera which is placed in the main pipe. Subsequently, it is filled with rapid-hardening concrete.

Plugging of laterals in manholes



Laterals in manholes are plugged by means of fibre concrete.

Selection of method

Method	Dimension of main pipe	Specification requirement for manholes	Endless	Length DN100 mm lateral	Length DN150/200 mm lateral	Length DN250/300 mm lateral
Short Hat Profile	DN200-DN1000 mm	Manholes of DN1 metre at both ends of the main pipe	Yes	30 cm	30 cm	
Long Hat Profile	DN200-DN1000 mm	Manholes of DN1 metre at both ends of the main pipe	Yes	10-12 m	15-17 m	
CIPP Lining from main pipe (without rim of collar)	DN200-DN800 mm V300-V800 egg-shaped 523x785 egg-shaped 575x863	Manholes of DN1 metre at both ends of the main pipe	Yes	10-15 m	15-21 m	7-10 m (Main pipe at least DN300 mm)
CIPP Lining from manhole of main pipe		DN425 mm DN1000 mm DN1200 mm	Yes Yes Yes	10-12 m 20 m 20 m	10-12 m 25 m/25 m 25 m	- 25 m/25 m 25 m/25 m
CIPP Lining from boundary manhole to main pipe		DN1000 mm DN1200 mm	Yes Yes	20 m 20 m	25 m/25 m 25 m/25 m	25 m/25 m 25 m/25 m
CIPP Lining from roadway inlet with water trap to main pipe		Roadway inlet with water trap must not be deeper than 3 metres.	Yes	Not possible	10-12 m	
Spot repair	DN150-DN1200 mm		Yes			
Lock Pipe Grout from main pipe	DN191-DN800 mm V300-V800 egg-shaped 523x785 egg-shaped 575x863	The distance from the manhole to the lateral which is to be plugged must not be more than 50 metres. Can be installed from a manhole of DN1 metre.				
Lock Pipe Grout from boundary manhole		DN425 mm DN1000 mm DN1200 mm				
Plugging of laterals in manholes		DN1000 mm DN1200 mm				



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