

## Procedure

# 2.2.51 Flexiliner II (pipe relining) Typ Plus: (Inversion)

## Type of Procedure

renewal, cleaning, pipe relining

## Notice

general information on the relining procedures are contained in Section 4.3.2 of the IP Construction, maintenance of non walk-in sewage systems

## License

KRT Engineering + Handel GmbH, Sempach

## Bidder

KRT Kanalsanierungs-Technik AG

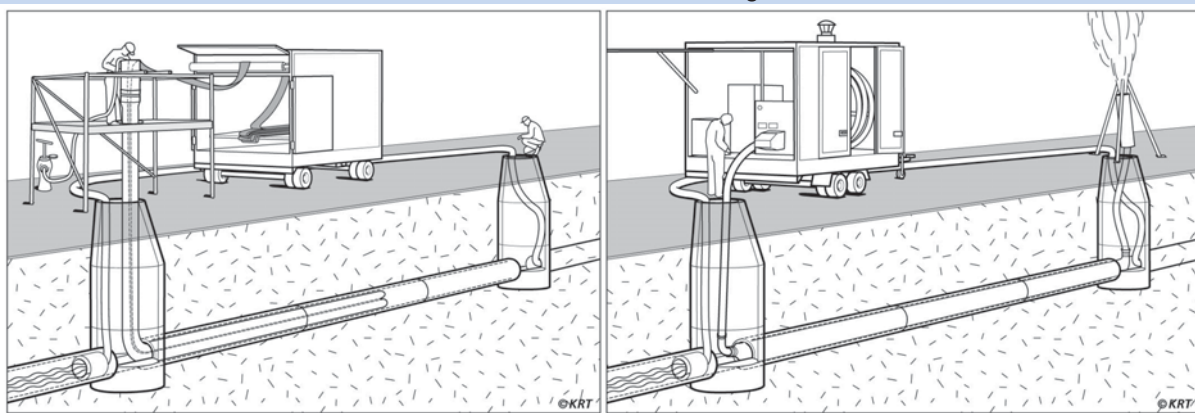
## Brief Description

A flexible hose which has been saturated with epoxy resin is inserted into an existing manhole and inverted into the sewer pipe which is to be renovated using water after which it is inflated against the sewer walls using compressed air. The epoxy resin is hardened under pressure achieved by blowing in steam or heated water. Seamless sheathing of the sewer pipe which lies tightly onto the pipe without leaving a circular gap is thus ensured.

## Schematic Diagram

### - Insertion Phase

### - Hardening Phase



## Materials

**Base material:** ready-to use hose made of synthetic polyester fleece, if required, reinforced by glass fibre fabric

**Resin:** diverse epoxy resin systems

**Layer thickness:** 3.0 mm to 24 mm depending on pipe diameter and load

## Standards

**EU:** DIN / EN 135566-4-2002

**D:** ATV Instruction Sheet M143 Part 3: Relining (draft)  
ATV Worksheet A 127 (statics)

## First Applications

Worldwide	1979	F (Copaflex)
Switzerland	1985	(Flexliner I)
Switzerland	1995	(Flexliner II)
	1998	(Flexliner II Plus)

# KRT Sewer Rehabilitation Technology

## Area of Application

**Damage Aspects**

- Open or damaged sleeves
- Cracks, flaking and light fragmentation in the pipe wall
- Corroded pipe walls

**Further Applications**

- Increase in performance capacity
- Increase or restoration of the static strength

**Restrictions**

Procedure only conditionally applicable for:

- Pipe collapse
- Deviation in position
- Excessive deformation in flexible pipes

**Pipe Material**

All materials

**Cross-Section Forms**

Circular, egg-shape and special profiles

**Dimensions**

Circular profiles NW 100 mm to NW 1250 mm

**Maximum Range**

depending on the dimensions up to about 125 m

**Curves / U Bends**

with reservations (wrinkling)

## Preparatory Work

**Excavations**

not usually required; access via inspection shafts

**Pipe Cross-Section**

high pressure cleaning, creation of the original cross-section by boring or cutting

**Lateral Connections**

cut back protruding connections

**Groundwater**

intensive groundwater flooding to be sealed in advance

**Draining of Water**

pumping out of wastewater and the lateral connections required

## Final Task

**Inspection Shafts**

transition from pipe / inspection shaft re-worked with special mortar. Tightness between pipe and relining in the transition area to be made safe with cladding

**Lateral Connections**

Reconnect from outside or cut the relining with sewage pipe robots from the inside. Thick wrapping of the connection pipe by commensurate measures (pressing, levelling out, shaped pieces)

**Treatment**

high pressure cleaning

**Acceptance**

inspection with pipe remote camera. Tightness test as per SIA N 190

## Remarks

- reduction of cross-section according to layer thickness
- wrinkling in curves dependent on pipe diameter, radius and angle
- No cladding between relining and pipe when using an outer foil
- In France until the end of 1990 about 17.5 km so executed; in Switzerland, until the end of May 1997, about 55 km

## Advantages of the System

- no excavations
- minimum traffic obstruction
- minimum cross-sectional losses
- short renewal time (1 day per sewage unit)
- improvement in pipe static
- improvement in the roughness value
- simple installation, mobile, also possible on the inside of buildings and in open terrain
- adherent connections using friction possible
- minimum installation requirements
- guaranteed service life of 50 years

## Status

January 2000

## Procedure

# 2.2.51 Flexiliner II (pipe relining) Typ Perfect: (Heeling)

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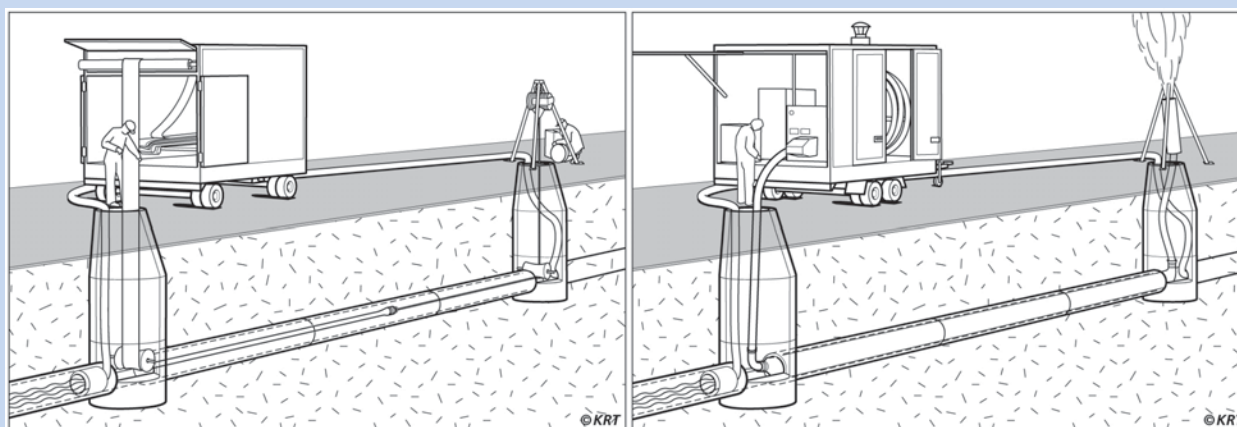
### Brief Description

A flexible, tube impregnated with epoxy resin is inserted via existing inspection shafts by cable winch into the pipe section to be renovated. Then the tube is expanded using compressed air and pressed against the pipe wall. The hardening of the resin takes place under pressure by blowing in steam. A jointless cladding is created which fits tightly without annular gap to the existing pipe.

### Schematic Diagram

#### - Insertion Phase

#### - Hardening Phase



### Materials

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Resin: diverse epoxy resin systems

Layer thickness: 3.0 mm to 24 mm depending on pipe diameter and load

### Standards

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ATV Worksheet A 127 (statics)

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Switzerland	1995 (flexliner II)

### Area of Application

# **KRT** Sewer Rehabilitation Technology

## **Area of Application**

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- Open or damaged sleeves
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Further Applications

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