Stadtentwässerungsbetrieb
Düsseldorf

Kanalbetrieb

Pilot Project

Cable in Canalisation

Otto-Hahn-Street
in Düsseldorf

Technical and Operational
Point of View

(Translation of the German original into English by KA-TE)

Introduction

Progressive development of telecommunications in Germany is combined with the enormous expenses of commercdial cable laying.

From this point of view it is considered sensible by the telecommunications companies to utilise the broadly developed infrastructure of the municipal canalisation networks and thus be able to construct an economic wide reaching communications cable network.

Today it is possible to install cable networks with little or no constructional effort in sewer pipes. The city of Düsseldorf was repeatedly asked to release its sewer network for such work in the past few years. The technical state of the art had at that time serious disadvantages and the request due to these disadvantages was declined.

The following frame conditions for an intact sewer network may under no circumstances be infringed:

- The function of the sewers must be guaranteed at all times.
- Damage by the materials installed must be excluded.
- Maintenance and cleaning must be possible without extra expense or effort.
- Retro-installation of connections must be possible to install without problem.
- Renovation or new installations must be possible.

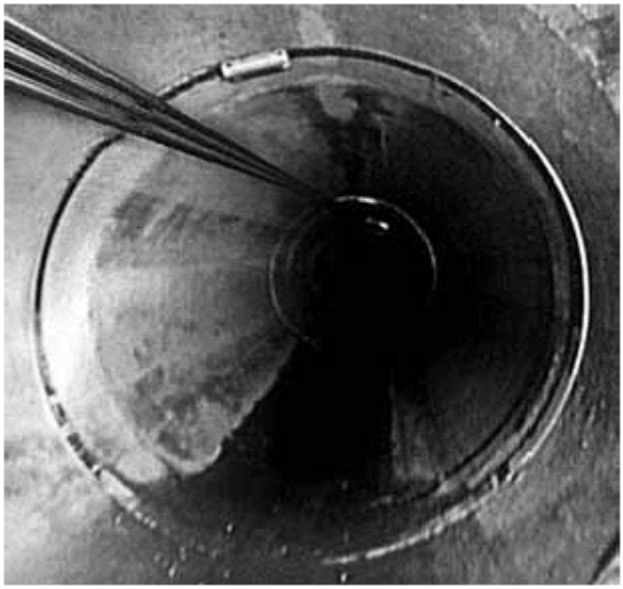
On the basis of these critieria diverse procedures were intensively investigated; these will be illustrated in the following.

Technical procedure for non-man-entry sewer pipes

- - Installation with tension
- clip / rings

Installation of the empty conduits with tension rings with cable installation after conduit installation.

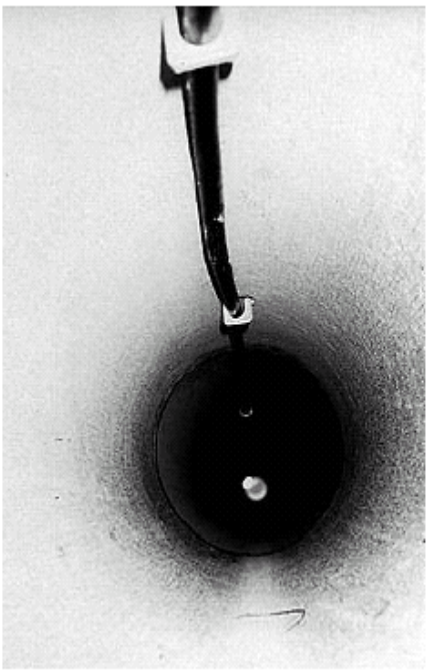
(Photo: Alcatel/KA-TE)



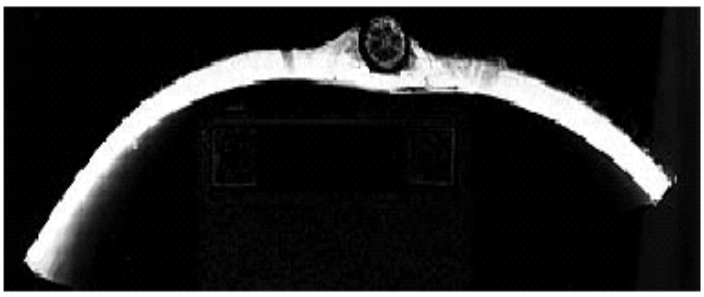
- Installation with rawlplug procedure

Installation of the cable using special anchors which are drilled and directly fastened onto the pipe wall.

(Photo: RCC)



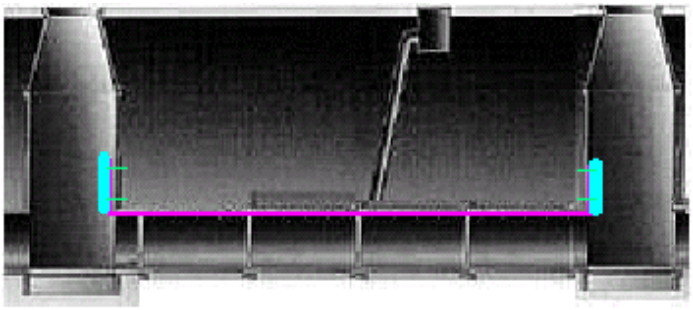
- Installation in adhesive bed procedure



Installation of an empty conduit or cable in continuous adhesive bed or inliner

(Photo: Insituform)

- Installation using tensioning devices



Installation of a special cable capable of with standing high tension between two manholes. The resulting tension forces must be absorbed by the manhole walls.

(Graphic: M. Schoppen)

- Installation during sewer renovation

Installation of a cable behind an Inliner during renovation.

(Photo: Insituform)

According to supplier information the mentioned procedures permit easy installation and conform to the afore-mentioned frame conditions.

Experience exchanges with operating companies have shown that the FAST-System as described in the following appears to be the only acceptable system.

System used FAST (Fibre Access by Sewer Tubes)

Installation with tension rings

Decisive for the choice of the FAST system was:

- destruction free installation
  - no drilling or cutting as with rawlplug or adhesive systems
- fastening of empty conduit every 1.5 to 3.0 metres
  - no sagging as is possible with tension methods
- avoidance of inliner with the exception of eventual necessary renovation
- simple disassembly for future renovation etc.

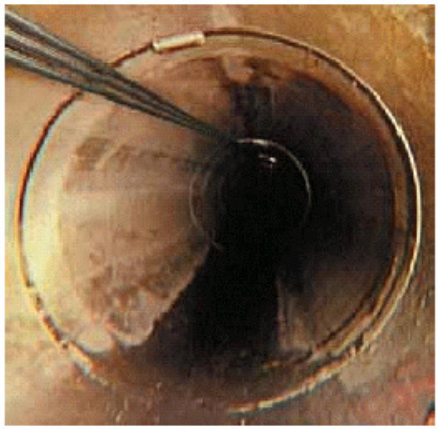
Installation of the fAST system in the Otto-Hahn-Street

Empty FAST conduits were installed in a mixed water sewer chosen by the city offices in the Otto-Hahn-Street during the CW 46 of 2001 (12.11. – 16.11.2001). The sewer concerned was a 250 metre long vitreous clay pipe of DN 300 diameter in a dormitory area with exclusively household waste water contents.

The central pieces of the installation are the tension rings the so-called inner brieden which are fitted with clips used to hold the 11.5 and 16 mm stainless steel conduits. These rings are sited at intervals of 1.5 to 3 metres whereby pipe joints and house connections are naturally observed.

This installation is followed by the installation of the empty conduit which is pressed by robot into the retaining clips as mentioned before. The appropriate fibre-optic cable can then be pulled into the condiut as required.

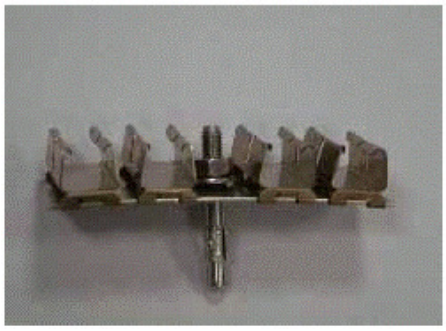
In the region of the man-holes different methods are used whereby the cable can be fed straight through the man-hole, fed out, spliced or stored.



FAST-System

Rings, conduits and clips

(Photos: AEONIS)



Installation steps

- Sewer CCTV inspection
- Measurement of the installation stretch paying attention to joints and house connections
- Installation of the rings according to measured installation plan
- Installation of conduit
- Insertion and fastening of conduit in clips
- Insertion of cable in conduit
- Installation of corresponding man-hole installation
  - man-hole diameter
  - cable configuration
  - cable depot container
  - joint connection (splice connection)

Operation

Different operational tasks were carried out on the stretch of sewer which was fitted with the FAST system materials as follows:

- Drainage in free fall in normal operation
- Cleasing “jetting” with diverse jets, nozzles and tools
- Drainage against the natural flow and fall
- Camera inspection (CCTV)

The installed system was subjected to extreme prolonged conditions using different jetting and cleaning systems. The sewer stretch was cleaned approx. 25 times using sewer cleaning bombs and shoes. Further in the region of badly installed conduits steel brushes were pulled repeatedly through the sewer. The sewer was artifically blocked to simulate flooding above the normal high water level.

Sewer jet nozzles downwards: Sohl cleaner, bomb, pull nozzle

Grenade

(Photo: M. Schoppen)

Nozzles with nozzle inserts (Photo: M. Schoppen)

Cleaning brush DN 300 with steel ropes (Photo: M. Schoppen)

Schedule

47 CW – 48 CW	2001	Sewer cleaning with different nozzles
49 CW – 52 CW		Draining in free fall incline
1 CW – 3 CW	2002	Drainage via back flooding by using a blocking disc in man-hole 7108. The result was the flooding of the sewer from man-hole 7100 50 man-hole 8114.
End of 3 CW		Removal of the blocking disc and subsequent CCTV in spection Cleaning and renewed inspection.
4 CW – 8 CW		Blocking disc re-inserted. Flooding from man-hole 8112 to man-hole 8104. Draninage was made by back flooding over the high water points in man-holes 8104 and 8114.
End of 8 CW		Removal of blocking disc and subsequent CCTV inspection. Cleaning with steel brush from man-hole 7117 to 8111.

During the complete duration of the a. m. test phase it was not possible to determine if there was an increase of sediment or other material attached to the installation rings and conduits.
Installation of incorrect conduits in the region of 8113 to 7107 where a measure of “sagging” occured. In this region no extra irregularities were found.

The incorrect conduits remained free from blockages and other materials.

Inspection and cleaning actions are only slightly impeded by the man-hole installation. It should be observed that cameras and clean apparatus be lowered carefully in the man-holes.

The rings and conduits present no hindrance to cleaning and inspection operations. Even when great efforts were taken to move the installation rings during cleaning operations this was unsuccessful.

Considerations

Connections:	It can not be excluded that even when safety precaution have been taken that the cable may be damaged by later construction measures especially when new house connections are drilled in place.
Data bank inclusion:	It is especially important that the cable plan be included in the existing data bank of the sewer network. An interface must be realised for this.
Leakage test:	Leakage test is no longer possible without removal of the system.
Renovation/ New construction:	Retrospective renovation is possible in limited cases. Where excavation is necessary the system must be removed.
Roots etc.	Cannot be removed as the cutting tool would damage the cable.

The considerations mentioned should be observed in the contractual sense.

The AEONIS company would like to construct 250 km in the next 5 years i.e. 50 km/year which must be mantained by the water department.

This work can not be done without the employment of extra personnell.

Stadtentwässerungsbetrieb
Düsseldorf

Kanalbetrieb

Evaluation

The selected street “Otto-Hahns-Street” can be considered as being representative for a normal functioning mixed water network.

The measures carried out show that even when draining over a water high point with flooding no extra layering of sediments etc. on the rings or conduits was determined.

The intensive cleaning operations corresponded to the cleaning operation of 25 years. Even extreme loading conditions have caused no recognisable damage to the FAST system.

From the technical and operational point of view there is no reason against installation of the tested FAST system as long as possible conflict potentials are regulated per contract.

Düsseldorf, 22. 02. 2002

Dipl.Ing. M. Schoppen