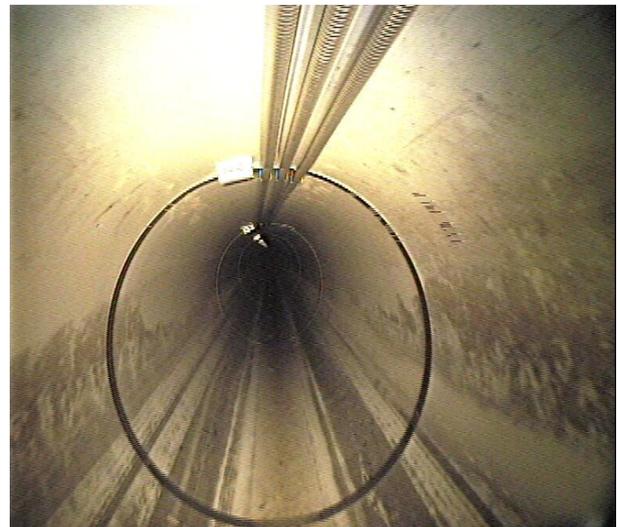
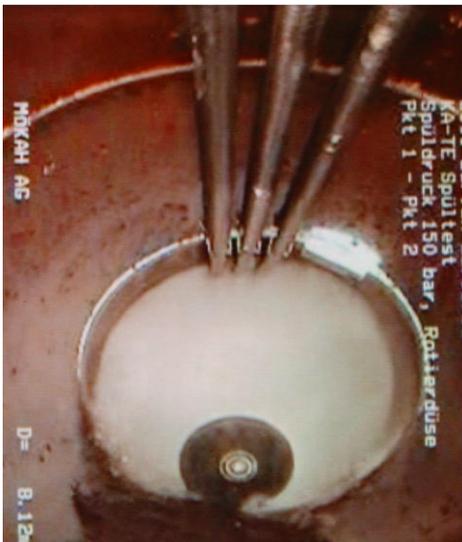
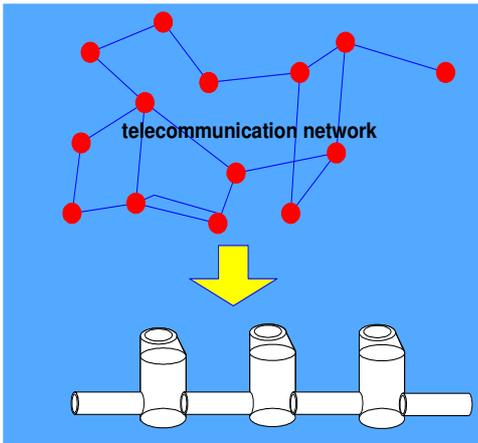




High-Tech Fibre Networks

Fibre Access by Sewer Tubes



Fibre Networks in the sewer with more than 400,000 meters installed.....

- **Efficiently**
- **Cost Effectively**
- **Environmentally Friendly**

.....every time

The FAST Technology

The FAST technology was purposely designed to enable the installation of a protective conduit network for fibre optic cables within any type sewer system. It can provide networks that will meet all present demands but also has the capability to be expanded for future requirements in an efficient, financially cost effective and reliable manner.

The sewer system can be non-man-entry and man-entry, wastewater, storm water or combined water.

The following description gives an outline of the fundamental features and requirements of the FAST technology.

FAST in non-man-entry sewers

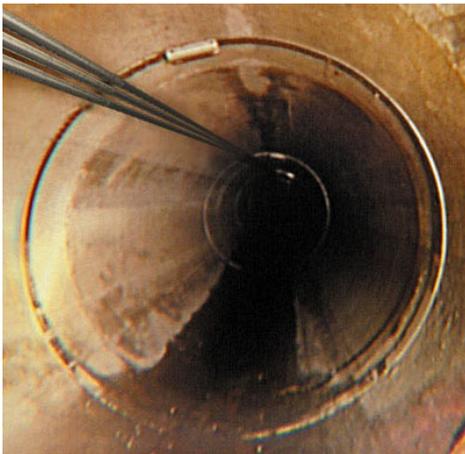
The FAST technology of installing protective conduits for fibre optic cables can utilise non man-entry sewers from 200mm up to and including 700mm in diameter. A robot has been specially developed “fit for the purpose” of fixing inside the sewer, stainless steel protective conduits with a diameter of 11.5mm or 15.5mm. These conduits are fastened into clips pre-mounted to rings (clamps). Clamps are adjustable straps made of V4A stainless steel which the remotely controlled robot positions inside the sewer at a distance of approximately 1.5m apart, dependent on the sewer conditions, i.e. laterals, offset joints.

The clamps are set into place by the robot expanding it to meet the internal sewer wall and triggering a spring box device that is mounted adjacent to the clips. The outward pressure applied by the spring box does not in anyway damage the structural integrity of the sewer. The clamps are supplied in varying sizes in relation to the diameter of the sewer and depending on the requirements of the network, clamps can be mounted with up to 9 clips, so that up to 9 protective conduits for 9 fibre optic cables can be installed. The amount of clips depends on the conduit and sewer diameter, i.e. in 200mm sewers a maximum of three 11.5mm conduits can be installed, in a 700mm pipe, the number of conduits can be up to either nine for 11.5mm or six for 15.5mm conduits. When the clamps are in place the protective conduits can be fitted by means of the installation robot.

With FAST the conduits are securely fixed to the inside sewer wall without drilling, cutting, screwing or being glued. No physical change to the structural integrity occurs during the installation.



All installation consumables are made of V4A stainless steel



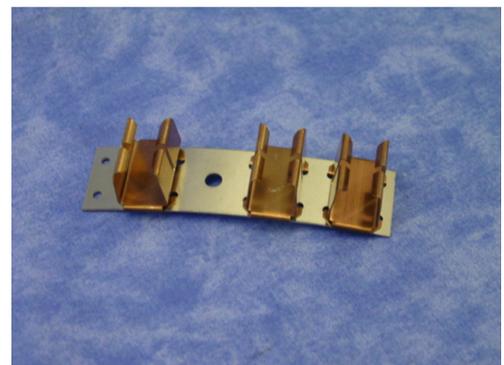
It is necessary in the planning of any proposed project that sewers, which are to be used, are determined and before any installation commences these must be inspected by the means of a sewer CCTV robot system. This will define whether the selected sewers are suitable, and if any repair work on the sewer or manholes is necessary.

In fact, the FAST installation begins with a visual inspection by the logging (mapping) module. During this mapping drive through the sewer, the exact location of pipe joints, laterals. This information will allow the software to calculate the optimal position of the clamps and clips.

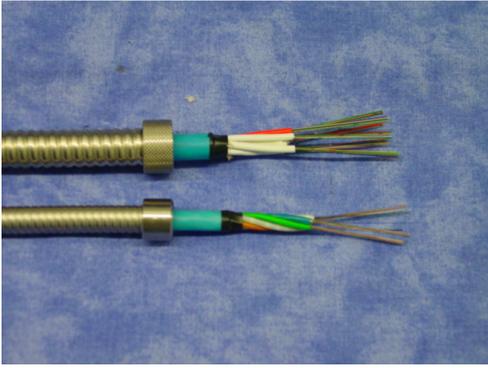
This data will be then provided to the sewer owner/operator on completion of all installation.

FAST in man-entry sewers

The FAST technology is also suitable for installation of protective conduits in man-entry sewer systems. Man-entry sewers are sewer pipes with a minimum diameter of 750mm. Instead of the 360° clamps, an alternative clip holder is used, i.e. strips of V4A stainless steel, mounted with similar clips as clamps. However, in man-entry sewers there is normally no restriction to the number of conduits due to the sewer size. The clip holder is fixed to the wall of the sewer by means of a bolt, at a distance of approximately 1.5m apart.



FAST protective conduits and fibre optic cables



An essential component of the FAST technology is the corrugated conduits made of V4A stainless steel, with an outer diameter of 11.5mm or 15.5mm. These protective conduits cause only a negligible reduction of the cross section of the sewer, and practically all normal sewer rehabilitation methods and maintenance can still be carried out after the installation. The stainless steel conduits are extremely robust, resistant and designed against corrosion, chemically resistant and vermin proof.

One of the most important requirements of the protective conduit is that it is flexible and can be supplied on wooden reels for storage and transport, which reduces the area needed on the worksite, but also that after installation in the sewer system, the conduits are straight, and directly along the inside sewer wall. An assortment of fibre optic cables is available to be installed into the protective conduits, and FAST is therefore not “product reliant” on a single manufacturer.

The only restrictions of a particular fibre optic cable is the external diameter, (15.5mm conduits will hold a single cable with 216 fibres which would provide 648 fibres in three conduits, in a single 300mm sewer) and these particular types of cables are specially designed and protected by a PE sheath that is suitable for operation in a sewer environment.

Manhole installation components

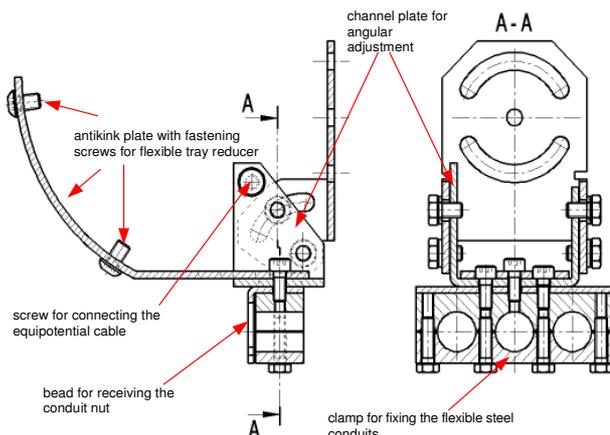
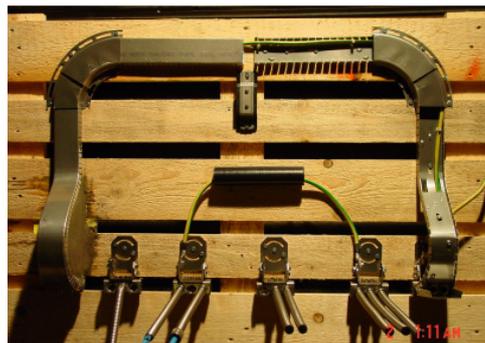
Sewer manholes represent important access points for FAST networks and depending on the network concept, special sewage resistant junction boxes (splice boxes) can be installed in the manholes. The splice boxes contain several hinged trays for single circuit and/or single element management, rendering the operation of the fibre optic network flexible and reliable. The splice box can be taken to street level for the purpose of splicing because additional cable can be stored in an over length box, which is connected to the splice box. Additional splicing does not influence or affect already activated connections. It is therefore highly recommended that an adequate number of over length boxes are included in any proposed network to allow for the connection of additional customers on demand.

Alternatively it is also possible to use conventional junction chambers next to the manhole.

All materials that are used in the manhole construction are manufactured of V4A stainless steel, these include:

- Conduit anchors
- Flexible cable trays
- Cable tray brackets
- Isolation brackets
- Bench anchors

All manhole construction is step safe and vandal proof. No cables are open to the sewer.



Operation of the sewer system after FAST installation

The installation of cables in sewer systems requests that all the requirements of both the network owner and the sewer system operator/owner are respected. It has always been of paramount consideration during the development of FAST, to produce a “fit for purpose” system acceptable to both parties. The installation of the FAST system reduces the cross-section of the sewer but only by a small percentage. The clamps once installed do not disturb the flow of sewerage more than a normal joint. In fact the clamps themselves present less of a restriction as the thickness of the strap ranges from 0.5 mm in small diameter sewers up to a maximum of 1mm in a 700mm sewer.

Maintenance of the sewer network can be performed as previously with no effect on the primary function of the sewer system.

- Pipe inspections by means of CCTV robots can be carried out as previously
- Sewer cleaning with high pressure jetting machines can be carried out as previously.
- Rehabilitation work on the sewer pipes can be carried out even with the installed FAST system; practically all conventional maintenance and repair techniques can be used.



High pressure cleaning operations do not influence the transmission properties of the fibre optic cables. There are no transient attenuations.

Benefits of the FAST technology

- The system is environmentally friendly.
- Efficient, cost effective and can be expanded to fulfil future requirements.
- Utilising existing infrastructure, i.e. sewers, reduces the need for excavation.
- A quick and easy way to install a new network.



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