

Alternatives For Installation of Optical Cables in Urban Areas

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The deployment of optical networks in urban environments can be highly challenging. Aerial construction is often not permitted, and in some areas of a city there may not even be utility poles available for use. Underground construction may also be prohibited for various reasons or become highly complex due to the high density of existing underground infrastructure (power networks, gas pipelines, water supply systems, telecommunications ducts, etc.). An additional challenge is that existing documentation of underground infrastructure is often not fully reliable or up to date.

Cities may guide the development of new networks by utilizing existing capacities of telecommunications operators or private operators of open access networks. One option is the lease of dark fibers in existing cables between required locations. It is also possible to use available empty ducts, enabling the installation of new smaller-diameter ducts or the installation of new cables to the desired destinations. This approach can significantly save time and often reduce costs. However, all of the above requires prior verification of the availability of existing telecommunications duct infrastructure.

The question arises: what should be done when new excavation in urban areas is not permitted, and when existing telecommunications operators' capacities are either fully utilized or not available in the areas of interest?

In addition to the traditional method of duct and cable installation, one alternative is the deployment of optical cables within existing utility infrastructure, such as water supply systems, sewer systems, district heating networks, gas pipelines, or other underground installations, in accordance with previously concluded agreements between the relevant parties.



Figure 1. Use of different sewer systems for the installation of ducts and cables

Installed ducts and cables must in no way interfere with the operation of the existing primary infrastructure. Furthermore, during repair and maintenance activities in the event of failures, disruption of the existing system must be minimal or completely avoided and carried out in coordination with the responsible authorities.

The available space for cable installation varies depending on the sewer system and ranges from small ducts with a diameter of 200 mm to large tunnels. In most cases, the available space is between 200 and 350 mm in diameter, which is sufficient for the installation of PE ducts, microducts, and cables.

Within sewer systems, PE ducts or microducts should be attached to the inner wall of the conduit, maintaining a straight route as much as possible and avoiding sharp bends or sudden changes in direction. The ducts must bypass existing valves within the sewer system, as shown in Figure 2.

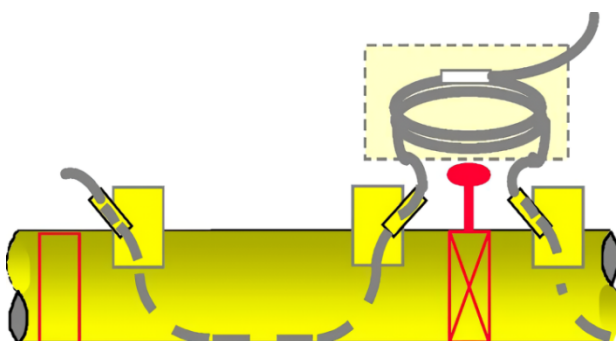


Figure 2. Cable installation alongside a gas pipeline (source: FTTH Council)

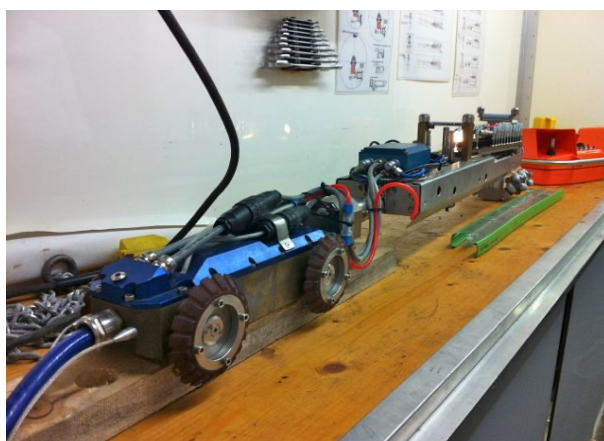
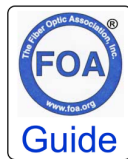


Figure 3. Robot for installing ducts in sewers (source: FOA)



Robots have been developed to assist in installing fiber ducts in sewers or similar pipes. This robot goes down the pipe attaching a fiber duct to the top of the pipe. Once the duct is installed, the fiber can be pulled into the duct.

Ducts and cables can also be installed through above-ground and underground tunnels such as those used for metro subway systems or highways, as shown in Figure 4. They are typically fixed to the tunnel wall near existing cables using appropriate mounting brackets. Cables should have adequate fire protection as well as rodent protection.



Figure 4. Installation of optical cable through a metro system (source: FTTH Council)

This method of cable deployment enables network expansion in urban areas and facilitates the connection of business and residential buildings as well as individual subscribers.

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