Last Mile Aerial Fiber to The Premises Network





About this DOC :

Proposal of AD-Tech . On 9 April 2025

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General Characteristics of the FTTP Last Mile Network

- **Typical assumptions of last mile network parameters in the final section of the FTTP network:**
- The entire distance from the Optical Line Terminal (OLT) to the farthest subscriber is implemented using fiber optic cables.

1. The average distance between the subscriber and the Fiber Access Terminal (FAT) is approximately 80 meters.
2. The optical splitter is positioned as close as possible to the subscriber for minimal loss and optimal performance.
3. Each cable is dedicated to connecting a single user directly.
4. In this segment, metal-messenger drop cables along with G.657 series bend-insensitive fibers are utilized.
5. Cabling in this section is typically routed along the external walls of building blocks.
6. Cables are secured to the wall every 30 cm using specialized clamps to ensure stability and durability.

General Characteristics of the FTTP Last Mile Network

Some Images of Drop Cable Installation in the Last Mile Network
in traditional networks

Images of Last Mile Network Installation Using Drop Cables



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Images of Last Mile Network Installation Using Drop Cables



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Challenges in the Last Mile of Existing Fiber Networks

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Standard assumptions used in designing and building a field access network:

1: Each individual block is connected to the ground fiber optic network at a single point through the installation of a Fiber Access Terminal (FAT).

2: If the excavation route exceeds 200 meters in length and passes alongside blocks with high population density and large area, additional underground branches will be provided every 200 meters, proportionate to the number of residents, to ensure sufficient capacity and optimal accessibility.

3: If the size of the block or the household population is below the specified threshold, the block will not receive an independent ground branch.

4: If the excavation path of the ground network does not pass through an independent block, that block will not have the possibility of receiving a separate ground branch.

Challenges in the Last Mile of Existing Fiber Networks

Block No. 161 with 163 households is connected to the underground network from two points

Block No. 161 has a large number of dead ends, which creates many problems during drop cabling

Blocks No. 160, 159, 156 and 155 have very few households and the underground excavation route did not pass by them



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Challenges in the Last Mile of Existing Fiber Networks

- Block number 387, with a population of 42 households, is connected to the ground network from one point and, due to the arrangement of the units within the block, has a large area, and the distance from the FAT to the farthest house is more than 300 meters.



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Challenges in the Last Mile of Existing Fiber Networks

- Challenges in the Last Mile Network Implemented with Drop Cables

1. The average length of drop cable routes, from the FAT located in each block to the subscriber, exceeds the 80-meter limit defined in the applicable standards.

2. When connecting subscribers in blocks without a dedicated ground FAT, the drop cable must cross several aerial routes, including streets and dead-end alleys.

3. If the size or population of a block is below the specified threshold, it will not be allocated a dedicated ground branch.

4. If the underground excavation path does not pass adjacent to a given block, it will not be able to receive a dedicated ground connection.

Challenges in the Last Mile of Existing Fiber Networks

Technical and Financial Issues in the Use of Drop Cables Based on the Existing Network Specifications:

a. The cost per subscriber increases significantly due to the extended cable length and the complexity of installing drop cables along long routes with numerous obstacles.

b. In the event of disconnection, the cost of network restoration due to the removal and reinstallation of drop cables is considerably higher than the initial connection cost.

c. Most drop cables are routed along building walls to reach subscribers, which causes visual clutter, complaints from property owners, and challenges in carrying out maintenance operations.

d. Due to the large number of drop cables emerging from FATs, managing connections, adding new subscribers, and troubleshooting become increasingly difficult and costly.

e. Even in its most robust form—with three steel strength members for increased tensile durability—the drop cable lacks a loose-tube design and gel filling. As the optical fibers are tightly fixed inside the cable, prolonged mechanical stress can lead to creep and elongation of the cable, exerting pressure on the fibers and eventually resulting in signal degradation or disconnection.

f. Typically, drop cables are not engineered to endure the short-term high tensile loads caused by long aerial installation spans. This limitation makes their use impractical—even temporarily—over extended aerial routes.

Proposed Solutions to Address the Challenges of Using Drop Cables

(A) Introducing a new layer in the network structure as the connection layer between MFAT and SFAT, defined by the following parameters.

It is worth mentioning that this layer has been officially incorporated into the updated operational guidelines of the S&D division

1.MFAT (Master FAT): A fiber access terminal installed via ground branching on the wall of independent blocks.
2.SFAT (Slave FAT): Fiber access terminals installed approximately every 150 meters from the MFAT and from each other, mounted on the wall of each independent block.
3.Each SFAT receives its capacity from the MFAT, and the SFATs are connected to each other in a continuous chain.
4.The connection between MFAT and SFAT is provided using high-capacity 12- or 24-core ADSS cables.
5.By using ADSS cables to cross streets, all blocks can be connected. SFATs are placed on blocks that do not have independent ground-based MFATs.
6.Subscribers are connected to the FTTP network via drop cables, with a maximum length of 80 meters, from the nearest MFAT or SFAT to the unit entrance.
7.When crossing streets, the ADSS cables are reinforced with braided steel messenger wires to enhance strength

General Specifications of Wall-Mounted Microduct

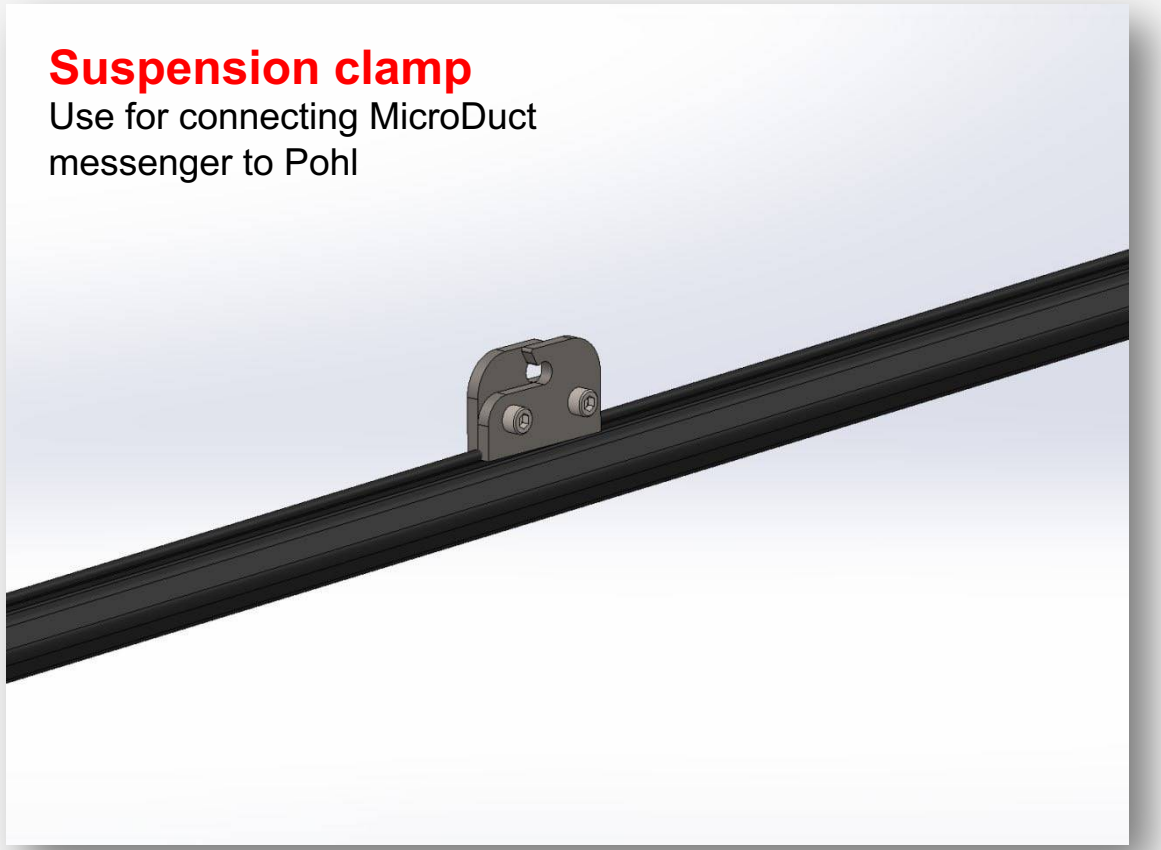
Technical Features of Wall-Mounted Microduct

1.Capable of withstanding up to 50 bar of air pressure during fiber blowing operations.
2.UV-resistant jacket and pipes with an operational lifespan of 20 years under direct sunlight exposure.
3.Tensile strength sufficient for aerial spans ranging from 10 to 200 meters under heavy load weather conditions.
4.Dual-layer jacket providing high resistance against mechanical stresses.
5.Equipped with deep hard grooves in the inner pipes to optimize fiber guidance and reduce friction.
6.High durability under wide temperature variations over long-term operational periods.
7.High mechanical resistance against excessive bending and permanent deformation.
8.Flexible pipe configuration that allows displacement without structural damage under high-bend conditions.
9.Composite materials and layered construction engineered to provide mechanical memory, enabling the microduct to return to its original shape after bending stress is released.

Accessories and Tools for Aerial Micro-Duct Installation

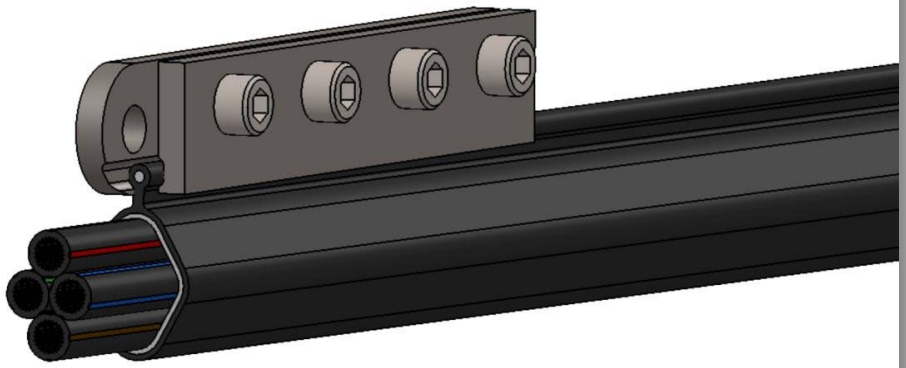
Suspension clamp

Use for connecting MicroDuct messenger to Pohl



Anchoring clamp

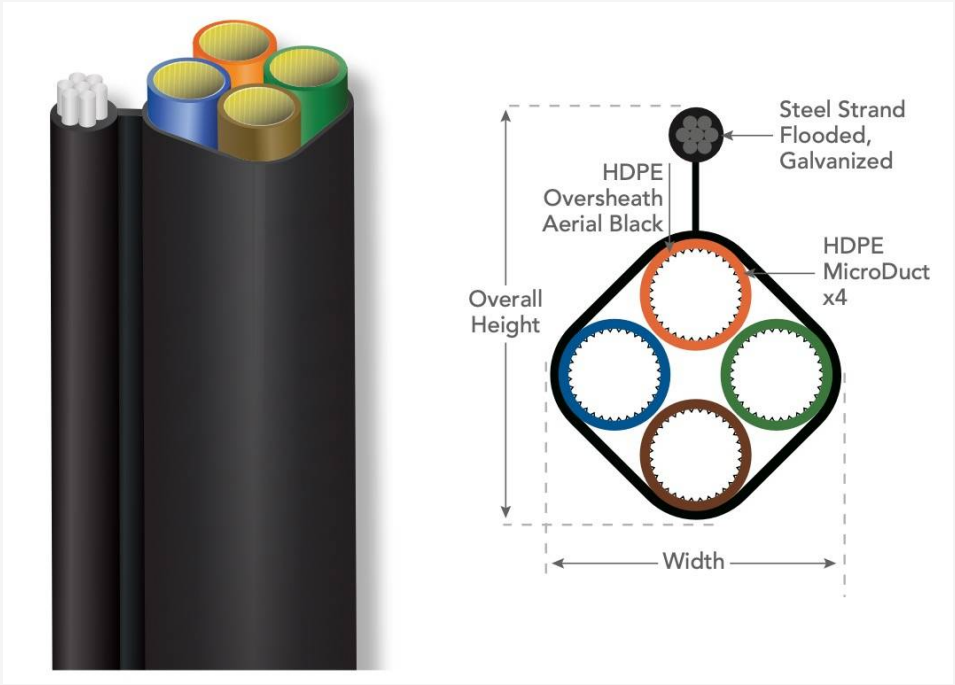
Use for connecting Microduct messenger to Pohl

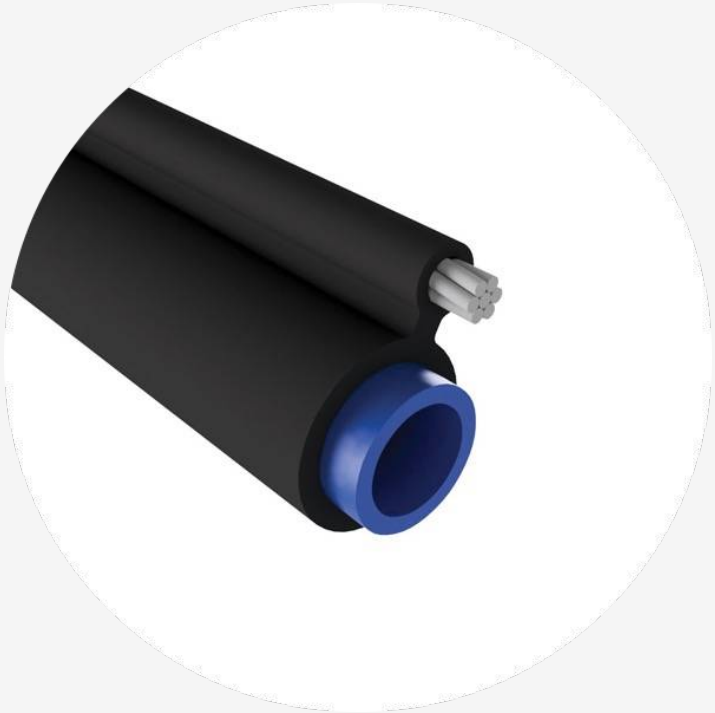


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Wall-mounted Microduct

Wall-mounted Microduct





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Proposed Solutions to Address the Challenges of Using Drop Cables

(B) Use of Wall-Mounted Microducts as a Replacement for ADSS Cables in Connecting MFAT to SFAT

Problems with using Drop and ADSS cables in the MFAT-SFAT connection layer and the benefits of using wall-mounted microducts:

1.During cable installation on walls, due to the presence of many physical obstacles, it's often either impossible to install a long continuous route or it results in very high costs and time. The cable must pass entirely through each obstacle.
With wall-mounted microducts and the ability to use connectors, existing obstacles no longer affect network deployment.

2.In the event of a cable cut, no splicing can be done directly on the cable. The installed cable must be removed and re-installed over the entire route, causing major time and cost losses.
With wall-mounted microducts, thanks to connectors and the ability to re-shoot the cable, repair costs are much lower and restoration is much faster.

3.Crossing streets using drop cables is virtually impossible, and long-term network reliability cannot be ensured. ADSS cables, though stronger, are too expensive when combined with the high cost of required accessories, making them economically unfeasible for extended spans.
Wall-mounted microducts can tolerate high tensile loads and support street crossings over distances of 150 to 200 meters without issue.

Proposed Solutions to Address the Challenges of Using Drop Cables

4.Drop and ADSS cables offer moderate resistance to mechanical stress (compression, shear, tension), which negatively affects long-term network stability.
Wall-mounted microducts offer mechanical resistance 3 to 8 times greater than Drop and ADSS cables, providing significantly better stability.

5.Wall-mounted capacity of ADSS cables is limited to 24 cores, and standard Drop cables to 8 cores.
Wall-mounted microducts can house up to 4 ducts, each capable of carrying 36-core cables, totaling 144 cores.

6.In distribution points, high-capacity cables must be fused into lower-capacity ones, requiring extra splicing.
With microducts, low-capacity cables are simply rerouted without cutting or splicing.

7.Drop and ADSS networks require many splices due to limited cable length, which increases signal loss.
With microducts and long-distance cable shooting, splicing is minimized and signal loss is avoided.

8.Expanding a Drop or ADSS network in the future requires complete rewiring at high cost.
With wall-mounted microducts, future expansion can be done quickly and affordably.

Proposed Solutions to Address the Challenges of Using Drop Cables

Problems with traditional implementation, poor appearance, and technical network problems

Proposed Solutions to Address the Challenges of Using Drop Cables



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Proposed Solutions to Address the Challenges of Using Drop Cables

Network implementation using high-capacity wall mount microducts

Images of Wall-Mounted Microduct Network Deployment

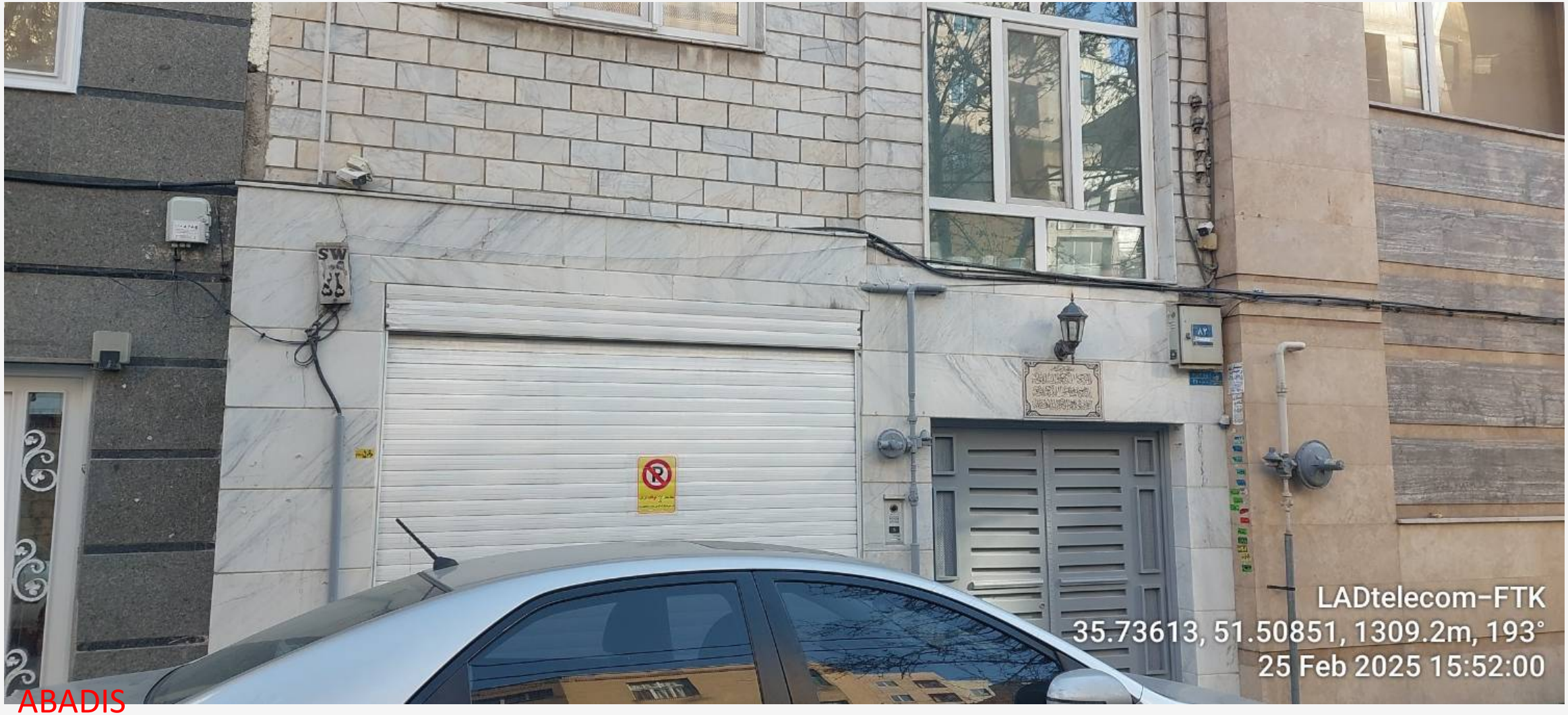


Images of Wall-Mounted Microduct Network Deployment



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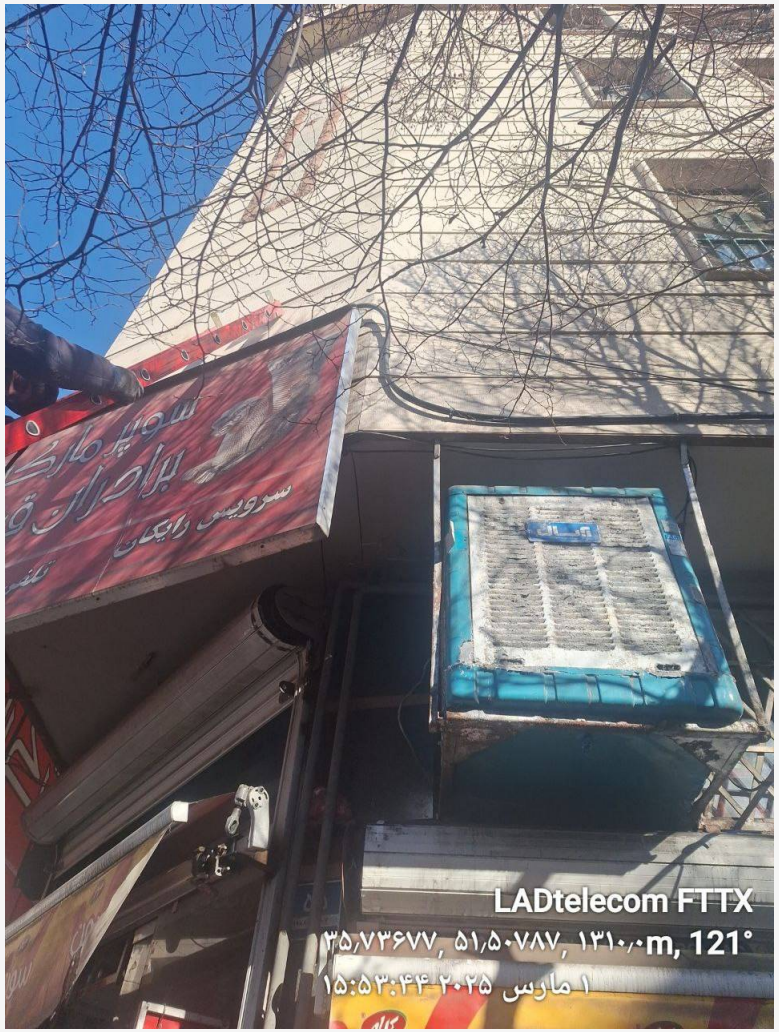
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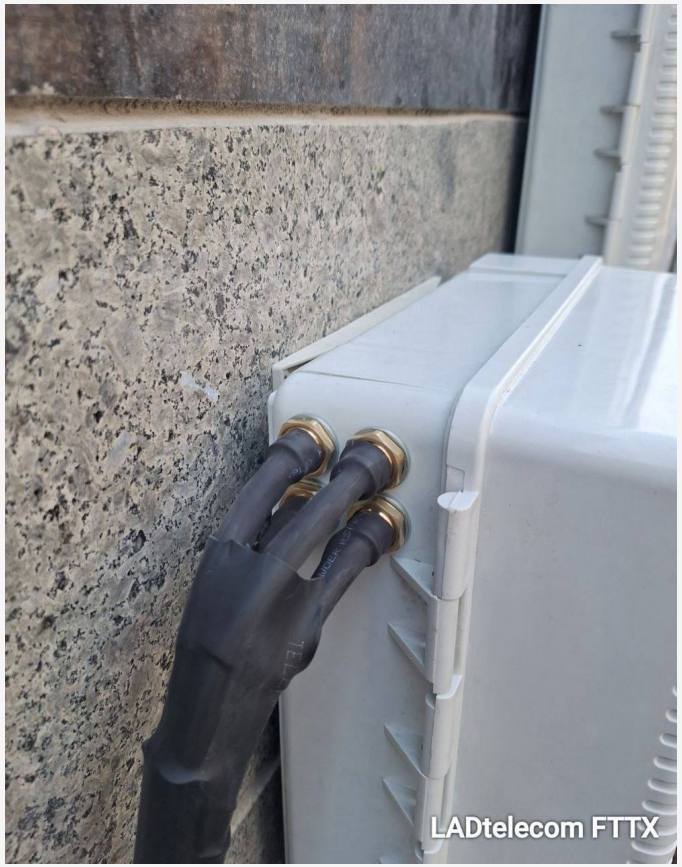
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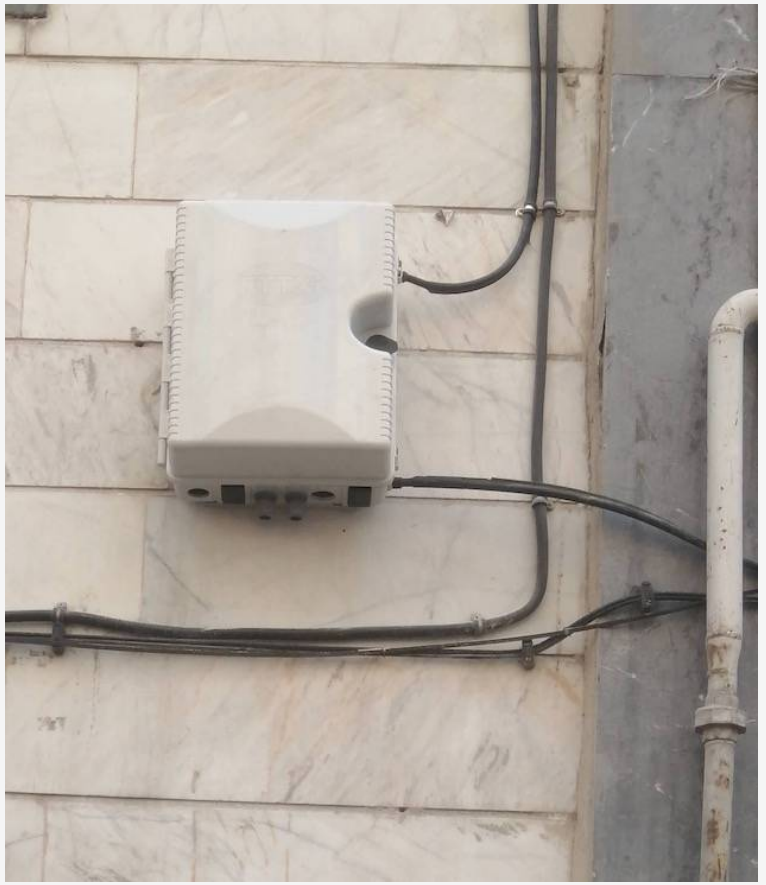


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Images of FAT in the Wall-Mounted Microduct Network







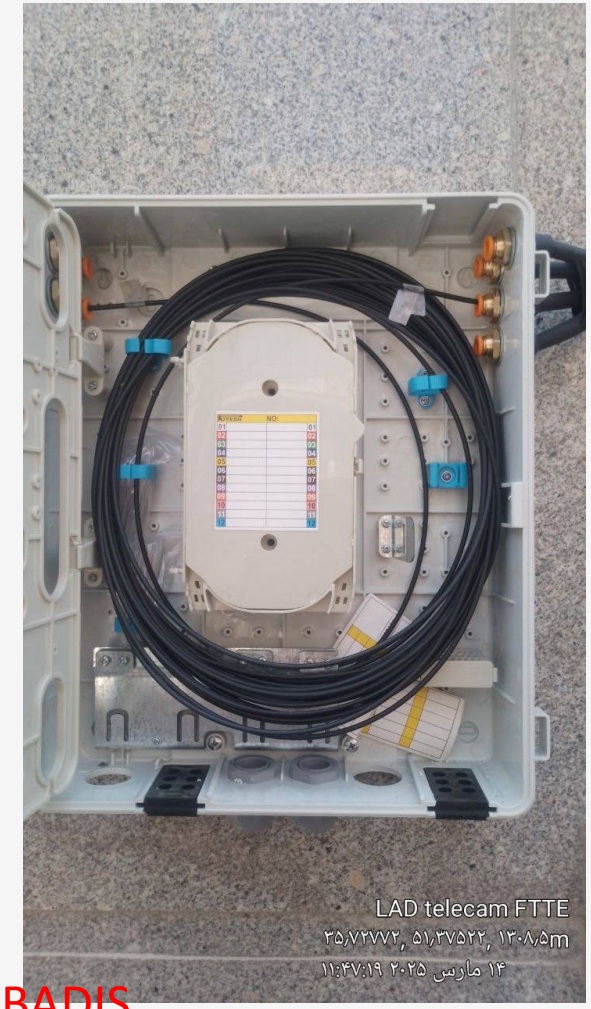
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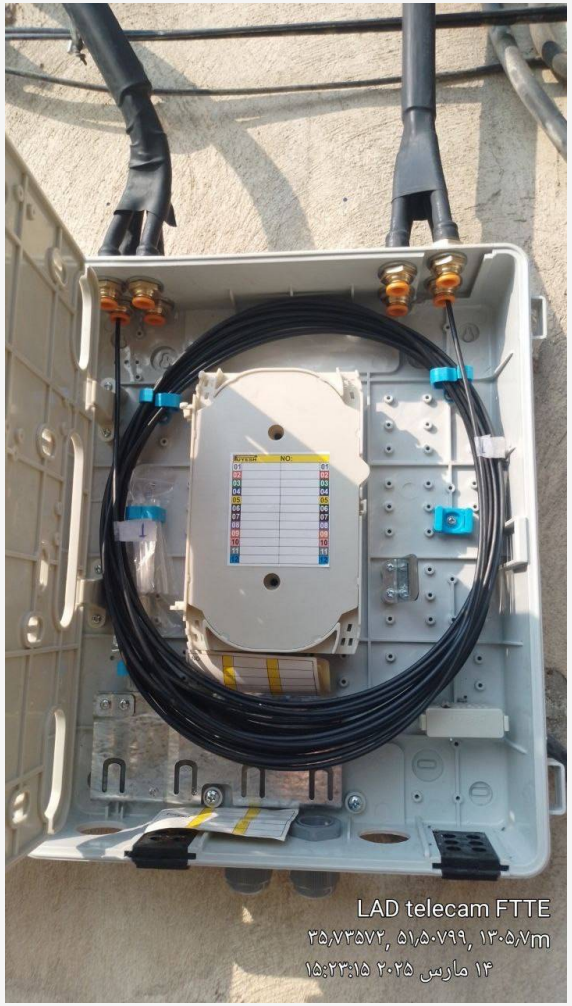
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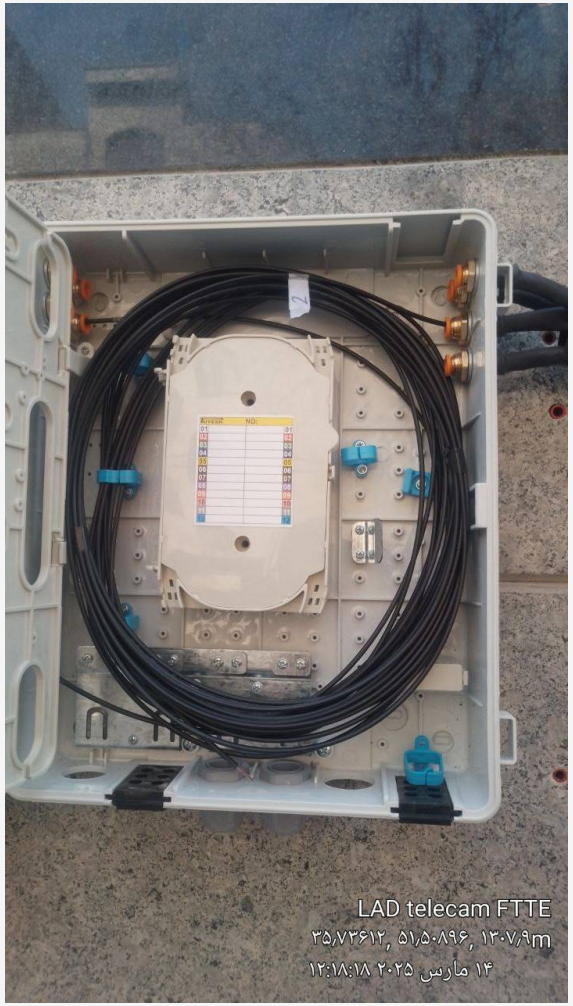


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Images of FAT in the Wall-Mounted Microduct Network







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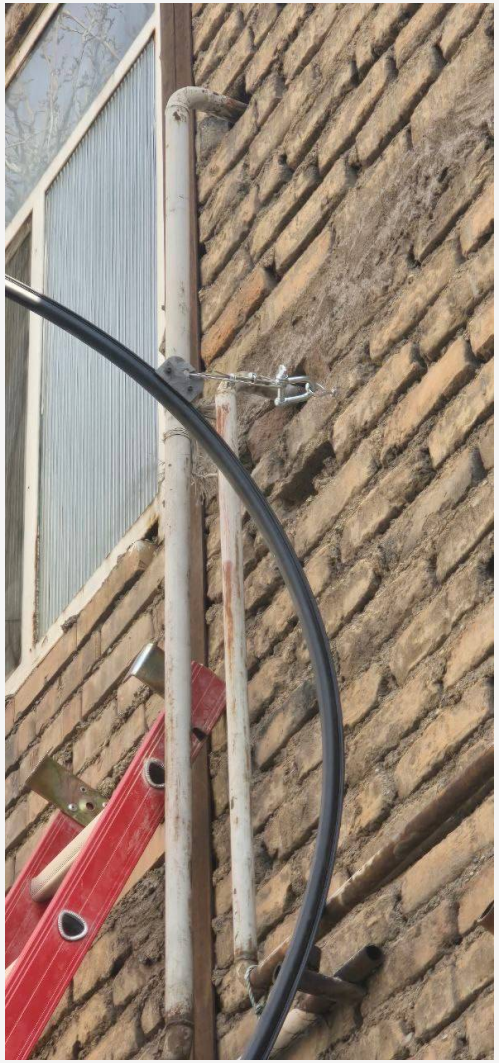


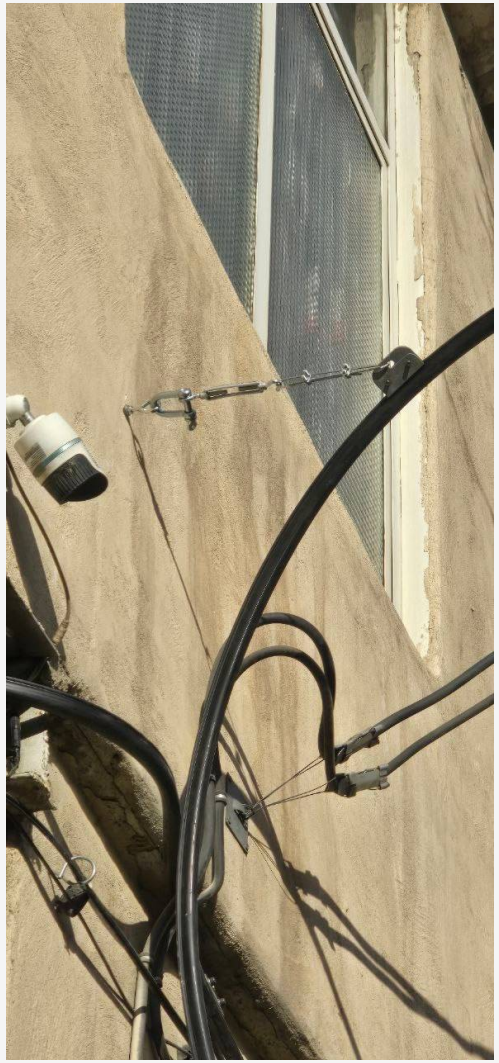
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Images of FAT in the Wall-Mounted Microduct Network





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Proposed Design Advantages

1. Much higher network capacity and coverage
2. Unparalleled reliability and quality
3. Future expansion at considerably lower expense
4. Lower maintenance expense and faster fault recovery
5. Network coverage in areas that are hard to reach
6. Connectivity of BTS sites to a backup fiber network



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- **Wall mount Fiber Optic Access Network solution**

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