



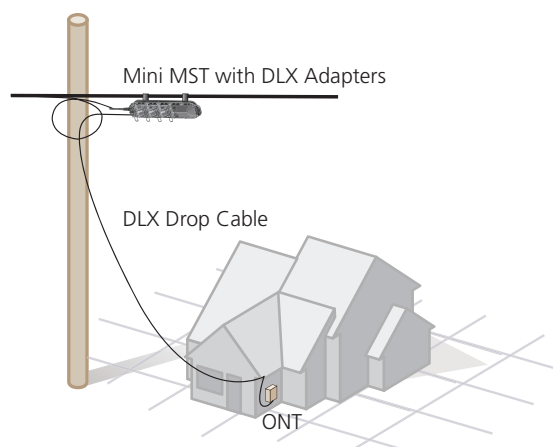
# Hardened Connectivity

## Considerations for better fiber drops in the OSP

From the start of their deployment plans, network operators know that selecting the right drop cable technology is critical for the job. A rugged outside plant (OSP) cabling solution is needed that provides maximum network flexibility at the lowest cost, and holds up to the highest quality standards for outside plant and inside plant use for years to come.

There are many challenges and considerations when choosing the right drop cable solutions. In a typical FTTH project, network operators have to order, warehouse and install multiple drop cable solutions. For outside applications, the drop cable solution has to withstand the rigors of extreme climate change, moisture and harmful UV. For indoor drop applications, the solution has to meet very different performance and labor requirements. Furthermore, network operators have to contend with crowded conduit space, hand-holes and pedestals, which only complicate fiber drop logistics.

Clearly, the requirements to deploy drop cable solutions can vary substantially from each FTTH project. And without careful planning and considerations of the technology used, costs can quickly compound for the service provider.



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## Plug-and-play architecture

To keep labor costs at a minimum, network operators need the ability to carry out rapid service drop connections and reconnections. A plug-and-play architecture creates a more technician-friendly system by minimizing the need for highly skilled laborers in making drop connections to the premises. By leveraging connectorized solutions, network operators reduce the number of splices required on the drop side of the fiber network, and installation and maintenance can be accomplished much more quickly and easily.

Connectorized solutions also help offset upfront deployments, where installing the drop to the premises can often be deferred until service is requested. Connectorized solutions also ensure better overall network flexibility, where the ease of mating connectors allows for fast service upgrades, changes or network reconfigurations. Network flexibility is an important consideration, especially considering the inevitable changes to fiber technologies and applications that will occur in the coming years.

## Build for reliability, performance

Reliable and efficient fiber drops can only be possible with connectors and adapters specifically designed and tested for use in the outside plant portion of the network.

Network operators should take care that any connectors in their network meet IEC and Telcordia standards designed to test for robust and reliable environmental performance. To meet these and other standards, TE employs a battery of tests to expose the rugged connector and adapter to thermal aging, thermal cycling, humidity aging, humidity condensation cycling, and post thermal cycling. These components then undergo vibration testing and a full range of mechanical stress tests, including flex, torsion, proof, and transmission with applied load. Additional requirements include impact and crush-resistance testing to simulate normal incidental forces. TE tests for water intrusion by submerging its connectors in water while also applying mechanical stresses.

## Preconnectorized technology

Utilizing plug-and-play solutions like the multiport service terminal (MST) with hardened adapters eliminates the need for splicing at the service terminal, which means the hand-holes or pedestals that store the service terminals can be much smaller and therefore can reduce materials costs, as well as simplify installation. MSTs are available with different lengths of OSP cable in 2-, 4-, 6-, 8- or 12-fiber configurations. Each MST tail returns to a centralized splicing point; splicing crews, therefore, don't need to move around and require much less time than before to make the same number of splices. This allows the operator to deploy the network more quickly, both in terms of homes passed and homes connected.



After the technician has secured the MST, pre-connectorized drop cables provide easy connectivity from the MST to the ONT at the subscriber's residence. Despite additional costs associated with adding connectors to service terminals, the savings in cable placement and the elimination of the need for splicing in sometimes difficult weather conditions, on a pole or at a wall more than offset the added expense of the hardened connector system. For example: A study recently conducted compared a spliced vs. connectorized approach with MSTs in a build-out of a 192-home subdivision. When comparing total costs for cabling, splicing, hand-holes and terminals, the cost savings for the connectorized approach using MSTs amounted to approximately €76 savings per home.

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## Leverage miniaturization



New drop cable technology has emerged, such as TE's DLX fiber optic connector system, which leverages a miniaturized set of hardened connectors and adapters. This smaller form factor family of connectors and adapters allows drop cables to be installed in tight conduit space, and requires smaller, less intrusive holes in structures. This minimizes the need for construction and ensures more cost savings when service turn up is required. The miniaturized connectors promote the use of smaller enclosures and service terminals—allowing more flexibility for installing on poles, hand-holes and other environments with limited space.

Drop cables with miniaturized connectors are ruggedly designed and hardened to protect from extreme temperatures, UV, moisture and chemicals. Backward compatible with older generations of hardened and non-hardened connector systems, these drop cables integrate seamlessly into existing fiber optic networks.

The development of the small form factor connector has shown great promise because it enables the use of smaller MSTs, or “mini” MSTs, that can more easily fit into smaller hand-holes and poles. Using the Mini MST, network operators avoid using invasive and expensive construction techniques to make the necessary service connections in small space environments.

## Advances in cable technology

Hardened connectors can be mounted on a variety of drop cables for either indoor or outdoor use or for both. Drop cables can be flat, round or figure 8, with a single or double jacket. The use of reduced bend radius fiber allows for tight bends when routing the drops without a noticeable increase in attenuation.

To manage both indoor and outdoor fiber drop applications, network operators are increasingly turning to universal drop cables, or all-in-one cable solutions that can serve both indoor and outdoor drop applications. This can be achieved by using a single jacket with material suited for both inside and outside conditions or by using a double jacket. TE's RealFlex universal drop is comprised of a flat drop exterior cable, which is hardened to withstand harsh outdoor conditions, and an inner 3-mm simplex cable that is UL-listed and approved for indoor use. To transition from outside to inside plant is just a matter of stripping off one cable from the drop assembly. For the outdoor portion of the deployment, installers employ the same hardware and techniques they have traditionally used and there is no change between the MST and the outside of the building. With the universal drop cable, the need to precisely measure cable lengths is no longer required. Installers simply choose the next-higher standard length and then store any slack cable.



Another innovation in drop cable technology that is changing the OSP landscape is the multifiber hardened drop cable. The multifiber cable incorporates 12 optical fibers in a single hardened design, and is terminated with a factory-sealed hardened multifiber fiber optic connector (HMFOC). The HMFOC connector meets rigorous design requirements that offer similar reliability and performance characteristics of the SC connector.

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Networks operators can leverage HMFOC-equipped solutions such as TE's Rapid Fiber Distribution Hub 3000 (FDH), flexible fiber box or Rapid Fiber MST to simplify cabling requirements in the OSP, and significantly lower deployment costs.

Innovations in drop cable technology are changing the face of fiber deployments by improving every segment of the network installation plan. Every benefit that allows accelerated deployment and reduced cost for fiber installations equates to more market share for service providers. As a result of these new installation techniques and technologies, service providers are improving the reach of their fiber networks, lowering their overall capital expenditures and operating costs, and capturing a bigger share of the telecom services market.



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