White Paper

Sterlite Tech

Plug & Play Smarter solution for FTTH deployment

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Released Date
January 2018

Abstract
As telecom operators across the world ramp up FTTx deployment, a cost-effective solution that can boost deployment speed is the need of the hour. This paper describes a pre-connectorized solution to deploy fibre in Multi-Dwelling Unit (MDU) and its advantages over field – connectorized solutions in terms of cost, time, installation skill and materials.

Key Words
FTTx, Pre-connectorized cable, Fast deployment

Introduction

Over the past four decades, the optical fibre has become one of the leading transmission mediums for communication systems. Optical fibre cable has been found to be an ideal solution for various application starting from the medical through to the submarine, terrestrial, sensor and data storage industries. Submarine optical fibre cables are connecting even the remotest parts of the world to the Internet. Increasingly, fibre is reaching deeper into home, businesses, factories and administrations enjoying the benefits of the superfast broadband. By 2020, over half the world is expected to have access to FTTx, which will make up 80% of broadband connections. Deployment of FTTH for greater capacity per subscriber, will need customized solutions to adapt to the varied landscape of cities. More components, different types of cables, optimal network design and new installation methods will be needed for mass and fast deployment of FTTH. In this paper we focus on a solution for easy and fast deployment of fibre in MDU using installer's existing skills.

Challenges faced during FTTH deployment

The most common challenges faced during FTTH deployment in MDU (Multi-Dwelling Units) are

- Requirement of skilled man power for field termination (i.e. fibre splicing)
- Requirement of skilled man-power

to follow standard practices during FTTH roll-out

- Provision for safe and secure storage of excess cable (cable slack)
- Availability of expensive fiber splicing machine for large scale roll-outs
- High number of materials/ accessories are need to be handled in the field
- Network reliability – excess fibre bending leading to unexpected increased bend losses,
- High splice loss in dusty building shaft environments

Sterlite Tech's FTTH solution for MDU: Customization and Engineering Deploying FTTH means reaching those final few hundred meters to the private detached home or building MDU complex from the nearest node where fibre is present. Sterlite has designed a passive ODN (Optical Distribution Network) solution which complies to class B+ optics i.e. 28dB power budget consideration.

Sterlite Tech's smarter FTTH Plug and Play Passive Solution enables fastest and reliable connectivity, which helps operators to complete Home Pass readiness in the shortest possible deployment time in high-rise and medium rise building scenarios; that too at the lowest total cost of ownership. Key attributes of the solution includes Compact, Modular and, Re-configurable Passive Enclosures, namely Main Distribution Box (MDB), Basement Distribution Box (BDB), and Fibre Access Termination-8 (FAT-8).

It supports different splitter ratio combinations. The solution can also be mixed and matched to enable both centralized and two stage splitting architecture as per varied deployment requirements of the telecom operators and infrastructure players.

All passive enclosures have very stringent Ingress Protection (IP) features (minimum of IP-65) that are compatible with both pole and wall-mount installations, giving the additional flexibility during installation. These enclosures also include splice holders to splice pigtails to the drop cables as and when required during its operation lifetime.

A rodent resistant spiral metal armour compact cable for stringent indoor (vertical and horizontal shafts) and outside deployment conditions has been used in this solution. The cable is made with Sterlite Tech's bend insensitive ITU-T G.657 compliant BOW LITE™ series optical fibres.

The key features of the solution and how it will overcome the challenges are explained below.

A. Solving the challenge of field termination: adapted pre-connectorized cable
Field termination by fusion splicing is a complicated process for a field technician. It needs more skill and availability of a skilled splicer are in high demand. In developed countries, skilled splicers generally work for large operators/ installers and not easily available. In developing countries, they are in short of supply and not feasible for a mass deployment. To achieve required skill, telecom operators need to spend more money in training the technician and more time to allow them to get required skill to carry-out splicing in complex FTTH deployment environment.

Sterlite Tech's FTTH solution comes with pre-connectorized cable which eliminates the need of expensive and time-taking fusion splicing. It eliminates around *60% fusion splicing required during field termination as shown in figure 2. Another advantage of pre-connectorized cables is that the high quality of factory-terminated connector which is able to meet the highest standards of polish and precise geometry leading to lowest optical losses and highest reflectance which is very difficult to achieve in actual field environments.

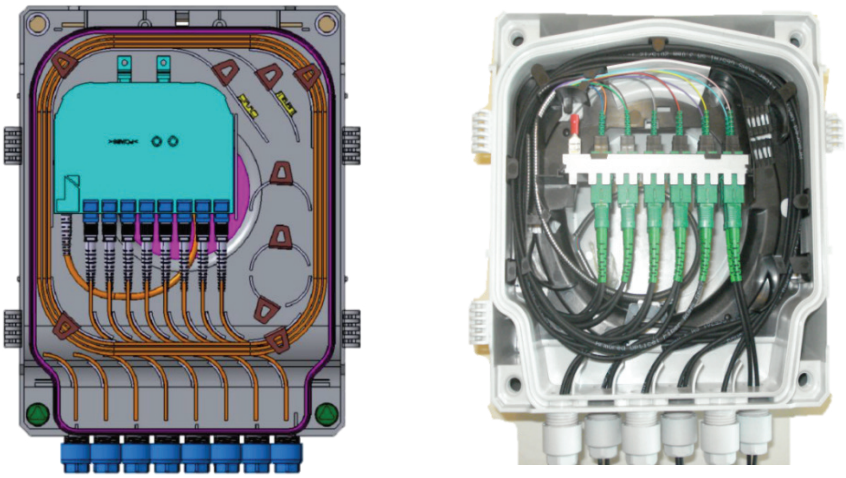


Figure 1 Distribution boxes with pre-connectorized cable

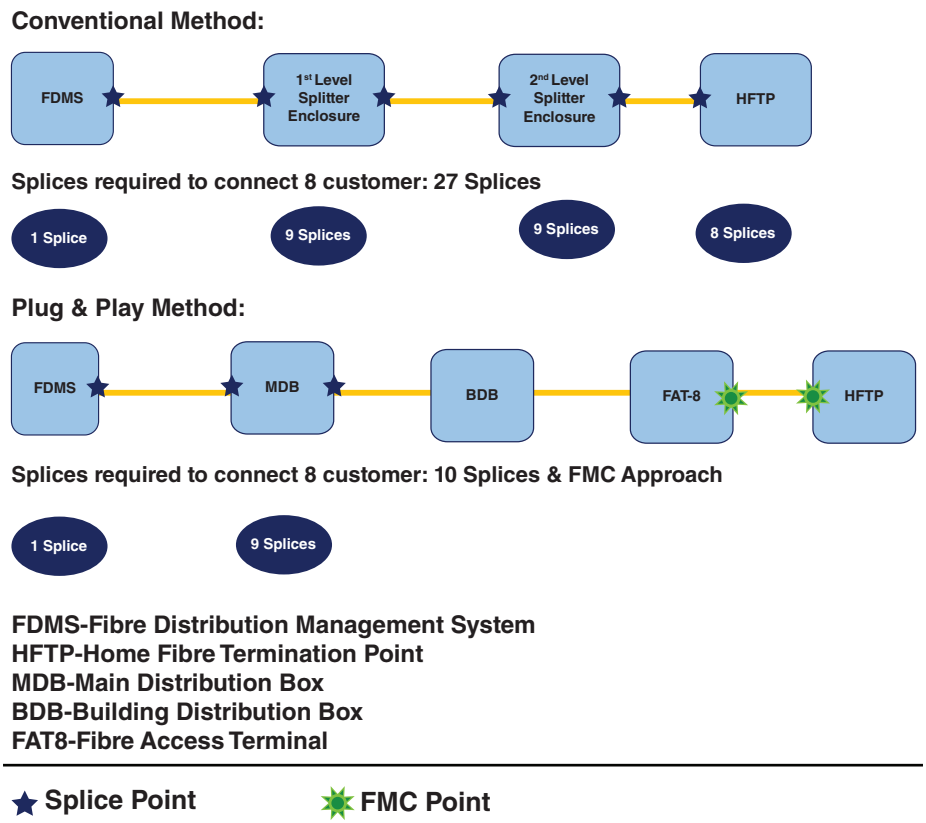


Figure 2 Sterlite Tech's Plug & Play solution reduces 60% of fusion splicing requirement compare to traditional method

B. De-skilling field termination

Pre-connectorized fiber helps the installer to complete the installation in far less time while achieving comparable performance. It doesn't need expensive instruments like fusion splicer, precision cleaver, etc and skilled professional to perform the splicing task. After fusion splicing, uncabled fiber need to be well-protected and well-dressed inside the splice tray as it is vulnerable to external damage. Precise cable dressing needs time and skilled professional. Improper fiber dressing inside the splice tray may lead to fiber breakage and fiber bend loss. Pre-connectorised cable doesn't need any fiber dressing of un-cabled fiber which is never exposed to external environment. Even semi-skilled persons having basic understanding of handling fiber cable can able to perform termination activities easily resulting decrease in likelihood of occurrence of error. Overall it reduces around 33% man-hours during installation compare to traditional solutions.

C.Future-proofing, Flexible and Reliable termination

Joining two glass fiber ends by fusion splicing involves localized heating, melting of glass and fusion of two ends, which is a fixed and permanent joint. It doesn't allow re-termination or replacement in a scenario where relocating customer terminal (distribution boxes) or replacing/swapping damaged drop/ distribution cables are necessary. Thus, pre-connectorized cable solution brings more flexibility and future-proofing.

One option to bring flexibility of fusion splicing is to splice with pre-terminated pigtails. In principle it works, however, it adds additional termination points and associated optical power loss. Extra controls are required to ensure high quality pigtails and polished connectors. This results in further complexity due to potential mismatch of fiber types having different mode field diameters, glass compositions and refractive index profiles. All these will lead to increase in network loss.

D.Better management of excess cable

One issue that is often involved with pre-connectorized cable is managing excess leftover cable lengths. Although few meters of cable slack are always best to have in case of repair, proper and safe storing of cable slack is a challenge. Sterlite Tech's FTTH kit solution offers customized lengths of pre-connectorized cable to optimize excess cable length. It also comes with cable stored in a coiled form at the back side of the box. The required cable length only need to be uncoiled during installation. The excess cable will always remain inside the box safe and secure as shown in figure 3.

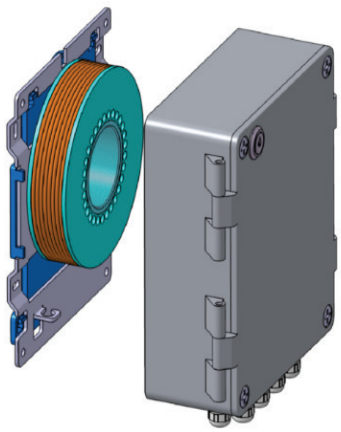


Figure 3 Distribution box have cassette of coiled cable

E. Spiral armored cable for conduit free in-building application

Sterlite Tech's FTTH solution comes with compact ,highly flexible spiral armored optical fiber cable using bend- insensitive ITU-T G.657.A1/A2/B3 category fiber options. The cable of length 30 meter is coiled inside the box as shown in figure 3. However, extra length till 300 meters are made available on request on throwaway spools. The highly rodent resistant and superior mechanical properties of spiral metal armoring help in easy and fast deployment even without a conduit/ duct. The cable can be stapled or sticked on the wall directly. It can be pulled inside an available duct which significantly saves installation time and requirement of extra materials. It is mandatory to do proper grounding / earthing of the metal armor cable at both the ends. All distribution boxes are provided with earthing mechanism.
The FTTH Solution is also available with high tensile CPR compliant LSZH (Low Smoke Zero Halogen) compact cable variants to meet customer preferences across different regions.

F. Advantages of distribution boxes

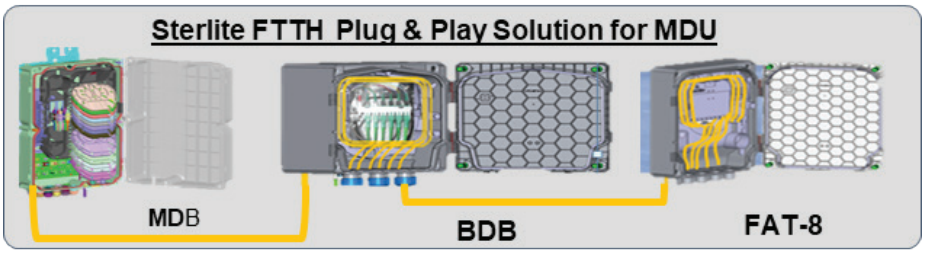
Sterlite Tech's FTTH solution comes with three distribution boxes- Main Distribution Box (MDB) containing primary splitter, Basement Distribution Box (BDB) and Fiber Access Termination-8 (FAT-8) containing secondary splitter. The salient features of the three boxes are shown in Table1.

FAT8: The IP 67 rated Fibre Access Terminal (FAT) is mounted in multi-dwelling units on the floor level and supports up to 8 service end points.

- Ready-to-install Kit with pre connectorised SC-APC Cable ends completely, removing the need for

Table 1 Features of distribution boxes

Features	MDB	BDB	FAT-8
Dimension (Height x Width x Depth)	510 x 320 x 150 mm	210x205 x 115mm	260 x 210 x 75 mm
Ingress Protection	IP65	IP67	IP67
Wall/ Pole Mountable	✓	✓	✓
UV resistant	✓	✓	✓
Safety of flammability	UL94-V0	Fire retarding material, LSZH	Fire retarding material, LSZH
Mechanical rating	IK 07	IK 09	IK 09
Operating Temperature	-25° to +65°C	-45° to +45°C	-45° to +45°C
Durability	>25 years	>25 years	>25 years
RoHS compliant	✓	✓	✓
Recyclable	✓	✓	✓
Slack cable storage	✓	✓	✓
Drop cable storage	x	✓	✓
Factory fitted splitter	✓	x	✓



Typical deployment scenario

Figure 4 Typical MDU deployment scenario of Sterlite Tech's Plug & Play FTTH solution

splicing of fibres within dusty in-building scenarios.
- Enables industry's fastest Home Pass MDU Readiness as unskilled labour can be used on the field.
- Unique SC-APC Casette Splitter allows quicker home connection activations using fast installable connectors or pre-connectorised drop ends at site.
- To support varied field lengths, the Kit can be delivered till 300 metre cable length, on requests.

BDB: The IP67 rated Basement / Building Distribution Box (BDB) is mounted in multi dwelling units on the basement or on the terrace. It supports up to 12 service end points to aggregate maximum of 96 customers.

- This ready-to-install Kit aggregates 12 FAT-8 in the most reliable and efficient manner, in shaft locations.
- Compact 6F/12F cable options with one end pre-connectorizsed allows installation of MDB many kilometre away at the optimum field location.
- The Kit is designed as per ITU-T G.657.A1 bend insensitive fibre needs.
- Both FAT-8 and BDB can be integrated into the network in the shortest possible time, thus allowing future customer subscriptions in the most economical way.

MDB: The IP65 rated Main Distribution Box (MDB) adds/drops fibre lines from the feeder to the distribution cables (splice and split) to BDB. It can support multiple BDBs with 6F or 12F cables.

- This modular load supports maximum of 16 primary splitters in high density population MDU pockets, as one grows the multi-use platform.
- Allows to speed-up mid-span installations, leading to faster connectivity readiness
- Compact non-metallic design, with 8 built-in SC-APC adaptors can also be loaded with optional 24 SC-APC adaptors.
- Easily accommodates cable with outside diameter from 3mm to15mm

Most of the components of the Kit are pre-assembled at the manufacturing unit itself, even unskilled manpower able to install with minimum hand holding, which will drastically cut down expenses incurred due to skill requirements. The installation can be accomplished by a two-members team, with more than 60% reduction in splicing incidents. The kit's compact and customised design takes care of fibre bend losses within the buildings and provides ease of operations and maintenance as well. Pre-assembled kit makes the logistics more efficient and curb requirement of excess cable storage in outside environment. Less than 5% wastage with proactive planning can be easily accomplished with the use of this kit. All these features are resulting in significantly lower total cost of ownership for the FTTH network.