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Fiber Optic Cable Choices for Electric Membership Coops (EMCs)

What cable type should I use for Fiber to the Home (FTTH)?

By: Mark Boxer, Applications Engineer Manager, OFS

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Electric Membership Coops

EMCs around the country planning aerial fiber-optic cable deployments have a number of important decisions to make. One of the most important decisions is which cable type to use and where on the pole to deploy it.

There are 2 main options for fiber cable type: standard loose tube duct cable and all-dielectric, self-supporting (ADSS) cables.

The 2 cable types are similar, and cross-sectional drawings of either cable type look almost identical. However, there are fundamental differences in the way they're designed and made.

PowerGuide® ShortSpan DT Cable

ADSS cables are designed to support their own weight as well as ice and wind loads. ADSS cables are designed primarily for aerial deployments, but can be used in duct applications, especially those requiring higher pulling tensions. The lowest tension an ADSS cable experiences is during installation. It canhandle ice and wind loads over its lifetime without any compromise in long-term reliability.

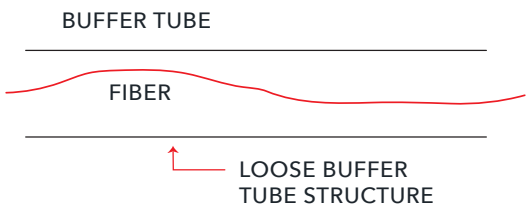
Fortex™ DT Single Jacket Loose Tube Cable

Loose tube duct cables are traditional outside plant cables. They are not designed to withstand wind and ice loads on their own, and need to be lashed to a metallic messenger. Usually, the highest tension they'll experience is during installation, and they are often limited to 600-pound short-term loads.

Both cables use "loose tubes" as the basis for the design. Loose tube designs have fibers loosely placed inside a plastic buffer tube with excess fiber length (EFL). The EFL in the cable and the helix angle of the stranding of the tubes enable the fiber to withstand temperature changes and loading while keeping optical loss low. Both designs can either have gel in the tubes or can be gel-free, but gel-free designs can reduce weight and be easier to prep in the field.

There are subtle differences in the design of the two cable types, which may include the size and lay length of buffer tubes as well as the amount of aramid yarn and other strength elements used.

Both cable designs have been reliably deployed for over 30 years.



Loose tube cable structure. Both loose tube duct cables and ADSS cables have this structure.

For Electric Coop FTTH Applications

Historically, loose tube cables are more commonly deployed in aerial networks, but this is mainly because they're often overlashed by telephone companies or cable TV companies that already have a messenger in place.

However, for networks without a messenger already on the poles, ADSS historically has been more commonly used.

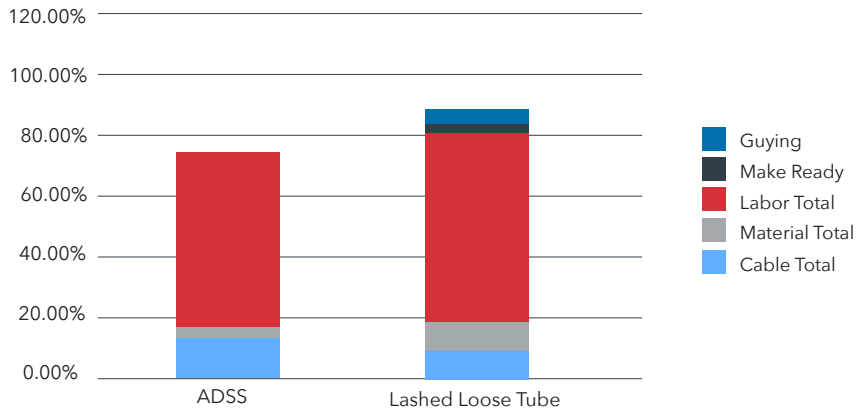
For electric coop FTTH applications, the main considerations are cost, speed of deployment, maintenance, and long term reliability.

Addressing these considerations, item by item:

COST

In most cases, when starting from scratch, ADSS is usually faster and less expensive from a total cost perspective. There are several reasons for this:

- With ADSS, only one cable is installed, versus two for the lashed method.
- Both products can be used in the supply zone, which can help avoid make-ready charges, but in reality, the vast majority of customers choose not to place additional metal cables in the supply zone.
- ADSS is all-dielectric, so typically there is no cable bonding, grounding, or maintenance needed. By comparison, lashed cables sometimes need periodic tightening or repair of the lashing wire if it has broken or loosened.
- An often overlooked difference is that the operating tensions of ADSS are typically a fraction of those of a messenger and lashed cables. This can significantly reduce guying requirements.



Relative costs to deploy a 50,000' network

When all of the differences are added together, the total installed cost of ADSS is typically significantly lower than lashed cables.

There are two situations where lashed cables can be attractive for coop networks:

1. When a messenger is already deployed and the coop has access to it.
2. In higher density areas where a messenger can reduce clutter and pole attachments for drops.

In most ther situations, ADSS will be the least expensive total installed cost option, which is particularly important in areas with fewer homes per mile to support the business plan.

SPEED OF DEPLOYMENT

For the same reason that ADSS is the less expensive option, installing one cable versus 2, it can also be the fastest option to deploy, which means quicker rollout and faster revenue. Installation speeds vary widely upon terrain and span lengths, but lengths up to 5000-6000 feet per day are not uncommon in areas with clean rights of way. Lashed cables are typically significantly slower to deploy.

Restoration of ADSS cable is also typically faster since only one cable is being restored instead of two (the strand and the fiber cable), especially in situations where spare cable loops are placed closely together.

LONG-TERM RELIABILITY

Both cables are designed for multi-decade life. Some of the earliest ADSS and loose tube cables deployed in the 1980s are still operational, and the quality of fiber has improved significantly since then. There is no reason why one cable type will be more or less reliable than the other, when deployed per recommendations and in a similar environment.

Long-term reliability of fiber cable is affected primarily by two factors – the outer jacket and the amount of strain placed on the fiber over the lifetime of the cable.

Outer jackets are typically made of polyethylene with carbon added for UV resistance. As long as the jacket is not breached, they will last for a very long time.

Regarding fiber strain, typical industry practice, based on fundamental research in how flaws in glass propagate under load, is to limit fiber strain under load to less than 0.2%. There is a fundamental difference in the way the cables are designed –

- Loose tube duct cables are designed to be supported by a messenger, so they can withstand a smaller load before the fibers experience strain that could cause long term fiber degradation.
- ADSS cables are designed to support themselves as well as ice and wind loads associated with the span lengths and tensions of the deployment conditions. This means that they can withstand higher loads before the fibers experience strain.

ADSS cable holding up a pole line. The cable was fine.

Both cable types have had multiple anecdotal scenarios where they've survived unexpected scenarios, such as cars crashing into poles, dump trucks snagging cables, etc.

One note about squirrels – OFS has heard feedback expressing concern that ADSS cable is more prone to being eaten by squirrels. After 30+ years of manufacturing both types of cable, we have no evidence to suggest that is the case. We are also very skeptical of "squirrel-proof" or "squirrel-resistant" cables. We know the various additives that are used to advertise these claims, and over the multi-decade expected lifetime of the network, we believe that any additional resistance is in the noise.

The same goes for the use of armored cables lashed to a messenger. The use of armor my buy months, but ultimately, if squirrels target the cable, they will likely succeed over time.

Our guidance, as has been the case for a very long time, is the standard tree-trimming that is part of the standard coop reliability regimen is the best long-term squirrel deterrent

The type of cable plant is one of the most important decisions a coop can make on the journey to providing FTTH services to its members. Keeping the above factors in mind can help contribute to the success of the network. For more information, please contact your OFS representative, or the author of the paper.

Mark Boxer is Applications Engineering Manager, OFS.

He has 30 years of experience in the fiber industry, in all aspects of the passive plant network, and has participated in the IEEE Power Engineering Society s standards process for ADSS cable for many years.

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For additional information please contact your sales representative.

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