

The Evolant® Report

Creating Tomorrow's
Access Networks ... **TODAY**



Issue 3

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- Ribbon vs. Loose tube: Total Installed Cost
- Time to Recover: Emergency Restoration
- Ribbon Cable and the Craft



The Virtues of Ribbon

Mike Ellwanger, Emerging Cable Applications Manager, Corning Cable Systems
Bill Sawyer, CATV Market Manager, Corning Cable Systems

Background

With extensive HFC networks in place, MSOs are well positioned to provide high bandwidth services to their customers. The fiber portion of these networks was built throughout the 1990s upon a solid base of loose tube fiber cable. Loose tube cable was an excellent choice for these networks because it is robust, widely available, easy to use and simple to splice.

Now, MSOs are responding to increasing bandwidth demands fueled by internet usage and high-definition video. Many have also realized that delivering service to business customers can be more lucrative than residential service. Networks are being expanded with cables containing higher average fiber counts to accommodate the influx of new CATV business opportunities. Fiber metro rings are being

built to support redundancy, and fiber is being driven deeper into the network with node splitting.

Some operators have recently started placing ribbon cable in these new builds in place of loose tube cable. With loose tube cable being the “defacto” standard, why are some operators now choosing ribbon cable? As with any other decision,

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Did You KNOW?

In ribbon solutions higher than 288 fibers, total installed cost savings can be as much as 15%.

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Background

it all comes down to the bottom line – in many cases, it is simply the lowest overall cost solution. Two major MSOs have understood the lower overall cost advantages of ribbon cable deployment since the beginning of their HFC builds. The reality of ribbon cable economics is spreading across the industry. The main financial components affecting cable design choice are:

- 1 – Total Installed Cost
- 2 – Time to Recover:
Emergency Restoration
- 3 – Pathway Utilization

North American Fiber Cable Usage

Fiber optic cable for the outside plant can be broken down into three main categories: loose tube cable, ribbon cable and flame-retardant (indoor) cable. In 2008, more than half of all the fiber deployed in North America was installed as loose tube cable, and

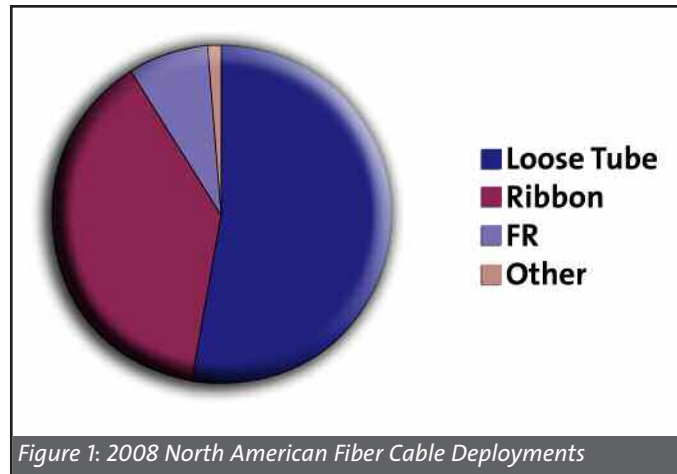


Figure 1: 2008 North American Fiber Cable Deployments

Source: Corning Cable Systems

slightly less than half was in ribbon cable (Figure 1, above). Those operators who use loose tube cable choose to do so because of its flexibility, familiarity and ubiquity. The remainder of this article will focus on the reasons why ribbon cable may be a better choice.

Why Ribbon?

1. Total Installed Cost

Capital expense is generally the single driver in the selection of a particular cable design. With loose tube cable typically being less expensive at lower strand counts, the choice would be obvious

if it were made on material cost alone; however, labor is a larger portion of a build's total cost than material. Any reduction in labor yields large impacts on Total Installed

Cost. The labor savings from splicing are exactly why many operators choose ribbon cable. A comparison of Total Installed Cost between loose tube cable and ribbon cable is shown in Figure 2 (Page 3, bottom). Sample calculations can be performed for the particular scenario and the exact labor rates of any area, but Figure 2 shows the cost to install a 2000-ft piece of cable and splice it at each end.

For the purposes of this example, it is assumed that the costs to pull each

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Ribbon Splicing



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Total Installed Cost

type of cable are the same. In reality, the lighter and smaller ribbon cable (for the same fiber count) may reduce costs. Other factors not quantified include shipping costs and pole/hardware utilization, but these generally favor ribbon due to its reduced size and weight.

In Figure 2, the cost of the cable alone is less for the loose tube solution, but the difference is made up by the labor savings during splicing; therefore, the Total Installed Cost for the ribbon solution is usually less expensive.

Even at very low-count cables the costs can tip in favor of a ribbon solution. In very high counts, like 288 fiber, the ribbon

solution's Total Installed Cost savings can be close to 15%.

2. Time to Recover: Emergency Restoration

Over time, fiber optic cables will become damaged. Poles will be struck by vehicles and below ground cable will be dug up. The FCC reports that for every 1000 km (620 mi) of fiber optic cable currently

deployed, there are 2.73 major outages every year caused by this type of damage. This means that if you have more than 200 miles of cable installed, you can expect a cable outage in the next year.

When cable damage creates a major outage, service providers lose revenue. Quickly restoring damaged cables is critical to

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	Ribbon	Loose Tube	Ribbon	Loose Tube	Ribbon	Loose Tube
Installed Length (ft)	2000	2000	2000	2000	2000	2000
Fiber Count	24	24	144	144	288	288
Installation Cost (Aerial, \$/ft)	\$2.80	\$2.80	\$2.80	\$2.80	\$2.80	\$2.80
Total Installation Cost	\$5,600	\$5,600	\$5,600	\$5,600	\$5,600	\$5,600
*Cable Cost (\$/ft)	\$0.40	\$0.30	\$1.95	\$1.80	\$3.55	\$3.35
Total Cable Cost	\$800	\$600	\$3,900	\$3,600	\$7,100	\$6,700
Time to Strip Jacket (min)	20	20	20	20	20	20
Time to Prep Closure (min)	15	15	15	15	15	15
Time to Prep Tube (min)	2	2	2	2	2	2
Number of Tubes	1	2	1	12	1	24
Total Cable Prep Time (min)	37	39	37	59	37	83
Time to Prepare Splicer (min)	20	20	20	20	20	20
Time per Splice (min)	12	5	12	5	12	5
Number of Splices	4	24	12	144	24	288
Total Splicing Time (min)	68	140	164	740	308	1,460
Total Prep and Splice Time for Both Ends (min)	210	358	402	1,598	690	3,086
Labor Rate - 2-Man Crew with Splice Trailer (\$/hr)	\$65	\$65	\$65	\$65	\$65	\$65
Total Labor Cost for Prep and Splice	\$228	\$388	\$436	\$1,731	\$748	\$3,343
Total Cost	\$6,628	\$6,588	\$9,936	\$10,931	\$13,448	\$15,643

Figure 2: Summary of Cost Comparison

* Cable cost can change based on jacket construction. These values are meant to be representative.

Did You KNOW?

An 864-fiber ribbon cable easily fits in a 1¼-in duct.

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Emergency Restoration

network success. Many providers choose ribbon for this reason. They realize that the time required to splice loose tube cable is at least four times higher than the time required to splice the same count ribbon cable. If a 432-fiber loose tube cable is damaged, it could take up to 40 hours of splice time with single-fiber splices. The same 432-fiber ribbon cable could be repaired in about eight hours. This means a network is up and running quicker, keeping lost revenue to a minimum. This is even more important in today's networks, which frequently carry business traffic in addition to traditional residential needs.

3. Pathway Utilization

Anytime MSOs deploy fiber cable in conduit, the issue of pathway utilization becomes critical. Sometimes duct space is leased at a high price,

and sometimes no ducts are available at any price, or new ducts must be installed. In these instances, maximizing the number of fibers deployed in a duct is an important consideration. If extremely high-fiber-count cables are needed, ribbon cable allows all the fibers to be pulled in a single sheath. This saves the labor that would otherwise be required to deploy fiber twice in the same location.

All of today's ribbon cables from Corning Cable Systems fit easily in a 1¼-in duct. Multiple cables can be pulled into larger ducts. Ribbon cables are available with

up to 864 fibers, density which is not available with loose tube cable. Ribbon cables are similar to loose tube cables in their flexibility and ease of installation through duct.

Common Objections Standardization

In any large existing network, it is prudent to determine the organizational inertia behind working with a particular cable design. Staff training and familiarity with proper procedures for installation and termination are very important. Equally important is the complexity associated with materials and supplies that are carried on splice trailers.

Splice closures, splice trays, heat shrinks and not to mention the fusion splicer itself, are all supplies that have been historically suited to one cable design or the other. Some of that is changing with the recent introduction of fusion splice machines that can perform both single-fiber splices and mass fusion splices. Additionally, the evolution of many of the products needed for splicing has led to more intuitive approaches. After simple training (many times provided free of charge by suppliers), splice technicians find themselves very comfortable with their ability to handle ribbon cable.

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Loose Tube vs. Ribbon
288-Fiber Loose Tube (left) and 864-Fiber Ribbon (middle)



Did You KNOW?

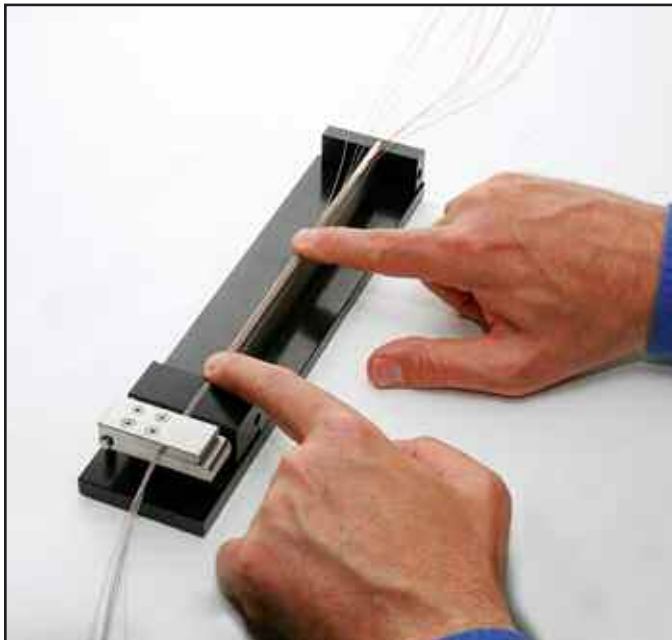
Restoration of high-fiber ribbon cable takes 25% of the time required for equivalent-sized loose tube cable.

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Ribbonizing Loose Tube Fiber

Working with Ribbon Cable

Ribbon cable is easy to work with, requiring the same basic skills to open the jacket, access the tube and splice the ribbon. Mass fusion splicers are readily available and often function similarly to single-fiber fusion splicers.

While it is true that ribbon cable is constructed differently, crew training takes very little time. Installation of ribbon cable quickly becomes

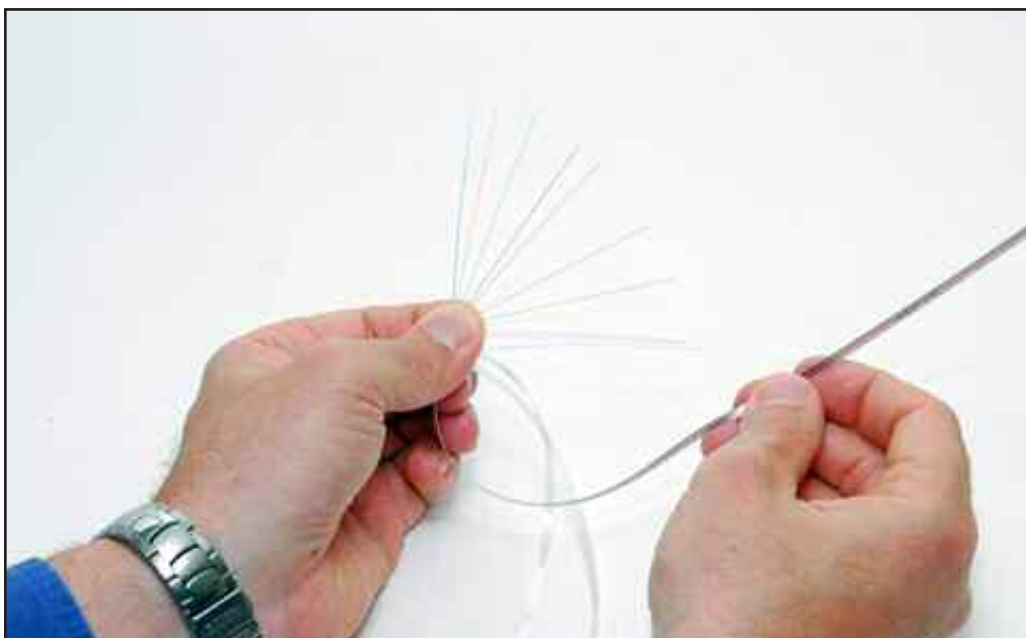
routine. A few additional tools are essential for midspan access of cable. The two most important are the UAT3 tool for opening tubes in midspan and the ribbon-splitting tool (RST). The image on page 6 shows some common tools used for ribbon cable installations.

Ribbon cable offers a high degree of flexibility. The ribbons can be mass fusion spliced to take advantage of labor and time savings. The ribbons can also be easily peeled apart to provide access to individual fibers when splicing to loose tube fiber cable. In addition, loose tube fibers can be “ribbonized” in the field to take advantage of the time savings of mass fusion splicing.

A Word About Splice Loss

In the past, it was assumed that splicing losses would be much greater in a ribbon system; however, improvements in fiber geometry as well as splicing technology have brought ribbon splicing very close to the

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Breaking Out Fibers from a Ribbon



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Splice Loss

performance of single-fiber splicing. In fact, ribbon splices with modern fiber and splicing equipment rarely exceed 0.10 dB, and average about 0.05 dB.

Summary

Each CATV network experiences unique challenges, but all MSOs share the goal of delivering the best service at the lowest cost. Because ribbon cable is not a one-size-fits-all solution, each

operator should consider their unique situation and choose the cable that makes the most sense for their position. A simple calculation will show how much savings are achievable through ribbon installations. These savings, along with the other benefits of reduced emergency restoration time and duct space savings, make ribbon fiber cable an excellent choice for today's CATV networks.

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Ribbon Tool Kit

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Corning Cable Systems LLC • PO Box 489 • Hickory, NC 28603-0489 USA
800-743-2675 • FAX: 828-901-5973 • International: +1-828-901-5000 • www.corning.com/cablesystems

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For more INFORMATION

Contacts:

Bill Sawyer

CATV Market Manager

828-901-5887

william.sawyer@corning.com

Visit:

www.corning.com/cablesystems

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