

# Ribbon Cable Makes Inroads In Rural Fiber Deployments

Rural FTTx deployers seeking to reduce deployment costs and recover more quickly from outages have discovered a secret weapon: ribbon cable.

By Tony Squires ■ *Sumitomo Electric Lightwave*

Rural carriers have come a long way since the days of the POTS network and local dial-tone services. The National Telecommunications Cooperative Association reveals in its recent 2009 Broadband/Internet Availability Survey Report that rural carriers “continue to deploy fiber at an impressive pace,” with nearly three-quarters of respondents planning to offer either fiber to the node (FTTN) or fiber to the home (FTTH) to more than half their customer base by 2011. Moreover, 75 percent of survey respondents now have a video offering, up from 68 percent just a year ago. Although these findings sound promising, 93 percent of rural carrier respondents cite fiber deployment cost as the number one obstacle to the widespread deployment of next-generation networks.

Rural broadband deployment is expensive because of the small to medium customer bases and long distances between homes and businesses. For a rural FTTx network to be profitable, it must be robust, require minimal maintenance and be quick to restore yet be scalable enough to accommodate a growing subscriber base. To stay within spending constraints and still meet customer demand for high-bandwidth triple-play services, rural service providers must adopt strategies that allow growing top-line revenue in a competitive environment while speeding customer turn-up and minimizing operational, installation and construction costs.

Rural providers trying to deploy fiber cost effectively face many technology



choices, including which type of fiber optic cable to use. Today, in what appears to be a new trend, many rural carriers are choosing optical fiber ribbon cable.

## LOOSE-TUBE CABLE LOYALISTS ENCOUNTER RIBBON

Unlike the large Regional Bell Operating Companies, which adopted ribbon cable and mass fusion splicing in the early 1990s, rural carriers and independent telcos did not need to address high fiber-density demands in their tree-and-branch network topologies. Average fiber counts in a typical system upgrade ranged from 12 to 48 fibers per cable. Therefore, these companies justifiably standardized on low-count loose-tube cables and single-fiber splicing.

In 2006, several Midwestern rural carriers, particularly in Minnesota and the Dakotas, experienced massive outages of new fiber access networks – outages that affected numerous communities and cost hundreds of thousands of

dollars for emergency restoration. In some cases, restoration took months. “The cause of the outages was attributed to the increased attenuation loss resulting from buffer-tube shrinkage from the thermal cycling conditions prevalent in the Midwest,” explains Todd Sapp, director of outside-plant operations at Vantage Point Solutions ([www.vantagepnt.com](http://www.vantagepnt.com)), a leading engineering and consulting company to the rural telephone marketplace. Although loose-tube cable buried in underground vaults served rural carriers and other telcos well for many years in POTS infrastructures, the results were quite different in rural FTTx networks, where loose-tube cable was housed in above-ground pedestals.

Acknowledging the problem of loose-tube cable shrinkage in the FTTx network, rural service providers and engineering consulting companies began to write requests for proposals requiring 10-year warranties against loose-tube

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*Rural telcos accustomed to using loose-tube buffer cable were skeptical about ribbon cable at first. After gaining experience with ribbon cable, they recognized its cost efficiencies.*

cable shrinkage. “Sumitomo Electric Lightwave and some other leading fiber optic cable manufacturers had not received any reports of loose-tube shrinkage with their loose-tube products,” Sapp says. However, given unpredictable environmental conditions and temperature fluctuations, especially in the Midwest, the wisdom of offering a 100-percent guarantee against shrinkage was questionable.

As a manufacturer of both loose-tube and ribbon cable, Sumitomo decided to propose a ribbon-cable solution that had been tested and proven over time in FTTH/FTTP networks. The ribbon-cable solution would not only resolve any possible risk of loose-tube shrinkage and outages but would also significantly reduce overall operational, installation and construction costs; improve speed of any necessary restoration; and yield faster customer turn-up and time-to-revenue.

Sumitomo’s presentation of the ribbon-cable solution to rural carriers and engineering consulting companies initially met with objections from longtime loose-tube users and loyalists, who recalled the days when ribbon cable was difficult to manage and mass fusion splicers broke their capex budgets.

However, demonstrations of the latest ribbon cable with easy-peel attributes, which often allow the technician to peel back the ribbon by hand and easily split the fibers, revealed advances in easy and quick ribbon-cable handling. Mass fusion splicers have also become much more affordable and easier to operate, and their splice results are comparable to those of single-fusion splicers. After seeing these demonstrations, many Midwestern rural carriers took the plunge and began to deploy optical ribbon cable in their networks to coun-

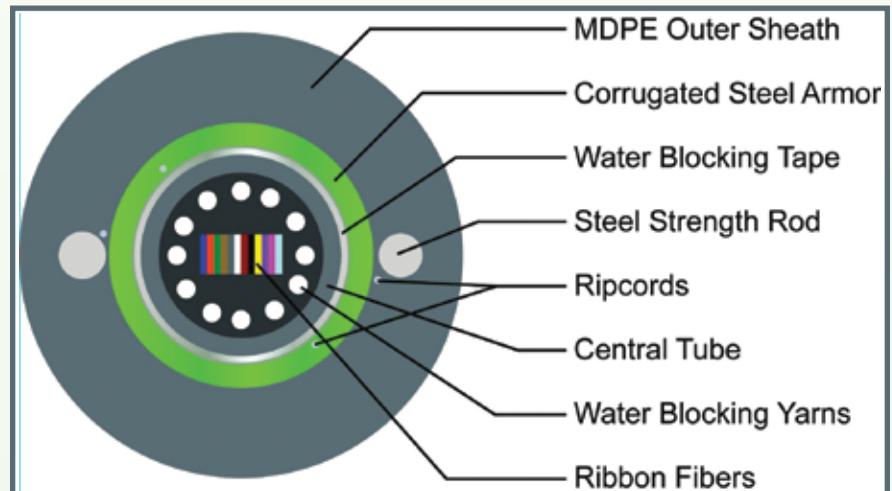
ter loose-tube buffer-tube shrinkage and prevent outages.

## EMERGING RIBBON – LOOSE-TUBE CABLE PARADIGMS

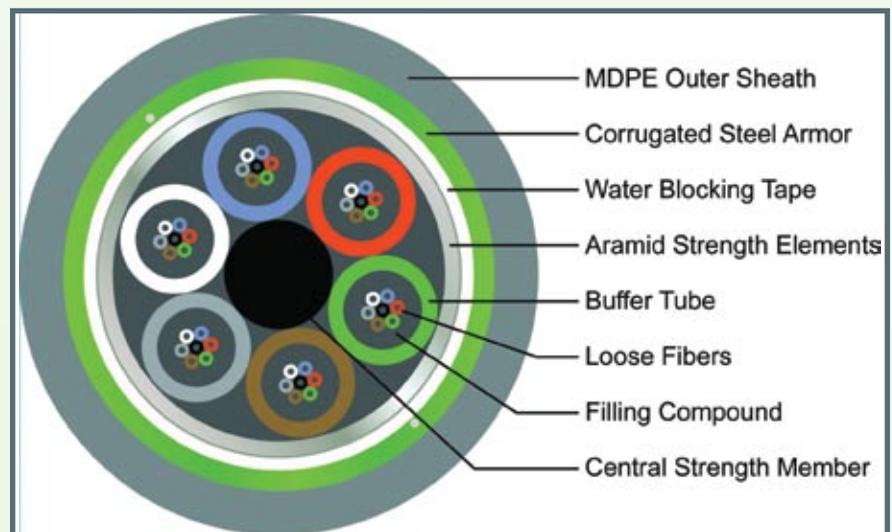
After the Midwest outages, the Rural Utilities Service revised RUS PE-90 (the specification for filled fiber optic cables) to address loose-tube buffer shrinkage. However, rural carriers that had tried

ribbon cable after experiencing or even learning about loose-tube buffer shrinkage did not then resume using loose-tube cable, as skeptics had expected. Rather, having stepped out of their comfort zone by trying ribbon cable, these rural carriers began to see the cost efficiencies of ribbon cable and gradually accepted its merits. Many installed ribbon into the backbone and expanded it farther into the access network, reserving loose-tube cables only for low-fiber-count applications and areas where subscriber density remained low. Other rural carriers adopted ribbon cable even in low-fiber-count applications for speed of project turnaround when justified.

Sapp says, “Vantage Point is increasingly engineering FTTx network designs



Ribbon Cable Cross-Section



Loose-Tube Cable Cross-Section

with ribbon cable because it makes the most business sense.” He adds, “When you think of ribbon cable as simply flat loose-tube cable, you’re reminded that it’s only the fiber packaging that differs. Ribbon cable offers flexibility so that you can treat it as loose-tube if desired, fusion splicing one fiber at a time. Because it eliminates the tube memory common with reverse oscillating lay (ROL) stranding methods, ribbon is easier to lay in outside pedestals, is easier to store in splice closures and allows for smaller and less-expensive closures. Ribbon cable designs also allow for higher fiber counts (432 fibers or more for ribbon, compared with a 288-fiber limit for loose tube), which assists in saving duct space.

“Of all the benefits associated with ribbon cable, the time and cost savings realized from using mass fusion splicing to speed up network restoration and increase project turnover are most valuable for today’s rural network,” continues Sapp. “Servicing rural customers quickly and efficiently at the lowest cost possible ensures the success of the rural FTTx network and the profitability, competitiveness and long-term viability of the rural service provider.”

## FASTER RESTORATION, QUICKER DEPLOYMENT

When rural carriers and independent operating companies were servicing their customers with dial tone and minimal telephone services, an emergency restoration did not present the great potential financial losses of today’s rural FTTx broadband networks. If a 64 Kbps service network experienced an outage due to a backhoe’s damaging the cable, the service provider lost a prorated portion of approximately \$25.00 per telephone line, the cost of the monthly service charge to the customer. In a 72-fiber-cable example, the provider would lose approximately \$1,800 of monthly service revenue.

In today’s FTTx network, a 72-fiber cable with a 1 x 32 splitter typically delivers broadband service to approximately 2,300 customers who pay an average of \$110 per month. Network downtime now costs the service provider a prorated

Cable Type	Number of Splices	Cost per Splice	Restoration Time	Labor Cost
Loose-tube with single fiber splicing	72 per side 144 total	\$35	1 to 2 days (faster if using FastCat Dual Heater splicer)	\$5,040
Ribbon cable with 12-fiber mass fusion splicing	6 per side, 12 total	\$120	Approximately 1 hour	\$1,440

Table 1: Restoration of a Backhoe-Damaged Cable With 72 Fibers

Cable Type	Number of Splices	Cost per Splice	Labor Cost
Loose-tube with single fiber splicing	7,000	\$35	\$245,000
Ribbon cable with 12-fiber mass fusion splicing	583 (7,000/12)	\$120	\$70,000

Table 2: Rural Exchange Deployment Requiring 7,000 Splices

portion of a \$253,000 monthly revenue base. Adding time and labor costs significantly heightens the financial stakes of a fiber outage.

As Table 1 shows, rural service providers save approximately 72 percent in restoration labor costs and can achieve at least 95 percent faster restoration turn-up by adopting a ribbon-fiber solution that allows mass fusion splicing.

The advantages of mass fusion splicing are also apparent during the deployment itself. Table 2 illustrates the time and cost savings resulting from using ribbon cable in a typical rural exchange requiring 7,000 splices. These savings lead to faster FTTx deployment, quicker project turnaround, faster customer turn-up and decreased time to revenue for the rural service provider, ensuring the most cost-effective and customer service-oriented network.

Providers considering incorporating ribbon cable into a loose-tube cabled network often ask whether loose-tube and ribbon cable can be interfaced. The answer is a simple “yes.” There are two methods of easily interfacing the two cable types: The first is to ribbonize the loose-tube cable fibers by stacking the fibers and spraying adhesive to simulate ribbon cable. Another option is to simply peel back the ribbon, easily split one fiber from the 12, and fusion splice or connectorize to the loose-tube fiber.

In an older loose-tube network con-

taining older-generation fiber, a core alignment splicer should be used, because the geometry and tolerance of older fiber is poorer than the latest generation of fiber, due to recent advances in fiber manufacturing.

## THE OUTLOOK FOR RURAL FTTX

As rural carriers continue to build FTTx networks and complete their transitions into triple-play broadband service providers, they need networks that are reliable, robust and cost effective to ensure their long-term profitability and competitiveness. Given the high cost of developing the rural FTTx network, rural carriers cannot afford to make the wrong deployment decisions, including their choice of fiber optic cable. The advantages of incorporating ribbon cable, including faster restoration, quicker customer turn-up, decreased time to revenue and significant savings in deployment costs, are inspiring more and more rural carriers to make ribbon cable part of their historic transitions. “We at Vantage Point definitely see an increasing trend among our customers to adopt ribbon cable,” Sapp concludes. “I believe that once the advantages of ribbon cable deployment are made clear to more and more rural carriers, ribbon adoption will continue to grow, confirming that wise choices in technology are being made for the long-term viability and ultimate success of the rural FTTx network.” **BBP**