Loose Tube vs. Tight Buffered—An OSP Installation Story
Part Two

By D.A. "Bo" Conrad, RCDD

OSP fiber cable preparation difficulties can cause contractor and installer nightmares. Here they are, in detail.

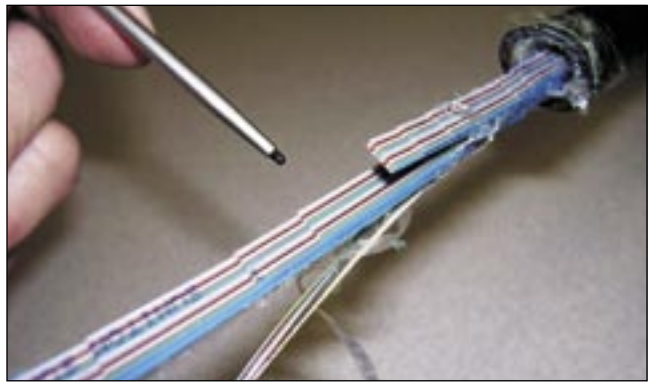
For many years, traditional fiber optic cable design for OSP outside plant applications was of a "loose tube" design. This is inclusive of aerial lash, aerial ADSS all-dielectric self supporting, direct burial with armoring (OFC or Optical Fiber Conductive), and the most popular campus type—underground or duct installation (OFN Optical Fiber Non-conductive meaning all-dielectric). **(PHOTO ONE)**

"Loose tube" originates from the description of having fiber optic strands (or ribbon-type cable) "loosely" floating in plastic 2.5 mm "tubes." This floating design allows for the thermal-related contraction and expansion of the jacketing without putting stress on the glass strands themselves.

Additionally, the individual tubes have water protection in the form of (a) an interstitial gel-like substance known as "icky PIC" **(PHOTO TWO)** or, (b) dry water-blocking tape or yarn. **(PHOTO THREE)**

THE MAGIC NUMBER

Six is the magic number in fiber cabling. It takes six (or 12) tubes to keep the cable concentric or round. If only one tube has fibers inside, the remaining five will be



PHOTOS ONE, TWO, AND THREE

PHOTO FOUR

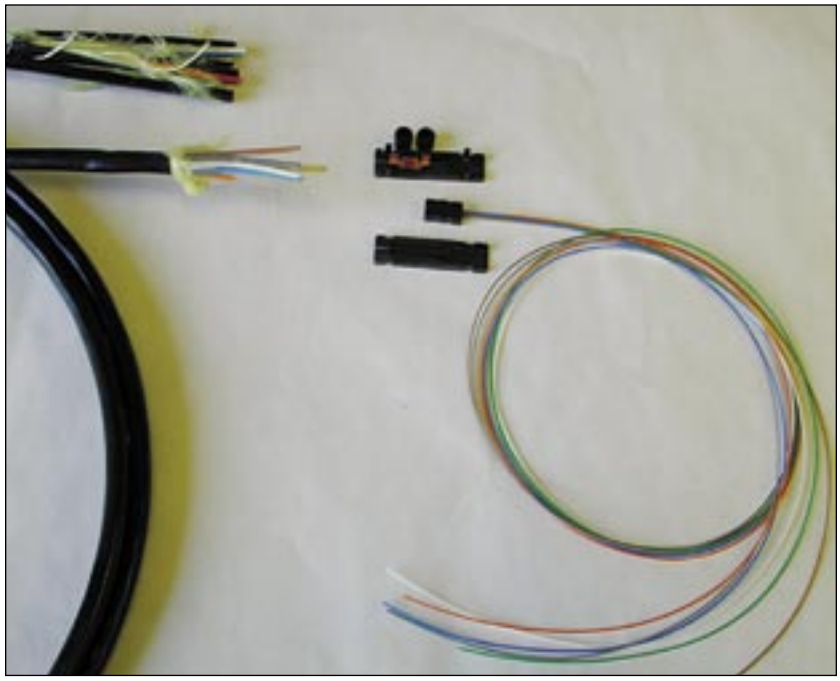


PHOTO FIVE

"fake" solid plastic (black or white) 2.5 mm tubing. The central strength member in the center of the fiber is typically made of a fiberglass or epoxy rod.

Each of these six tubes represents a subgroup and can hold from one to 12 each 250 µm coated fiber strands—for up to 72 (and 144 count fibers with 12 tubes). Each tube or subgroup as well as the individual fiber strands is color-coded.

Fiber cable is ordered and stocked in multiples of the magic six: (2 & 4) 6, 12, 18, 24, 36, 48, 72, and 144. Ribbon fiber combinations can approach 864.

For non-ribbon fibers, all the tubes are wrapped around the central strength member. Some manufacturers use the "S"—"Z" method.

Instead of one continuous "rifling" wrapping process that keeps the bundle very tight, the cabling is wrapped or molded for a few feet in an "S" configuration, then alternately in a "Z" fashion when viewed directly at the cable—or from a cross-section view-point. This method allows for "mid-span access" whereby the tubes can more easily be removed from the bundle for repair or splicing. **(PHOTO FOUR)**

In the manufacturing twining process, this whole bundle of tubes are held together using a ribbon-like Mylar skip-wrap or nylon cord, protected with aramid yarn (Kevlar™) and jacketed with a pull-string(s) to a variety of designs.

CABLE PREPARATION DIFFICULTIES

Many contractors cringe when discussing loose-tube cable, as cable preparation is a very laborious and costly process. The termination process for loose-tube cable requires a furcation "fan-out" or "break-out" kit. The "spaghetti-like" kit furcates (fans-out) the strands from the 250 µm to 900 µm.

Six- and 12-strand kits typically cost $18 to $24 each. **(PHOTO FIVE)**

Cable preparation requires cleaning, cleaning, and more cleaning.

After carefully removing the outer jacket, the tubes themselves must also be removed to expose the fiber strands. "Flooded" cables mean the tubes as well as the strands and Kevlar are flooded with the gel. The messy, sticky-like gel is removed by using Texwipes™ with a Goo Gone™-like, non-toxic gel-remover.

Next step: A *second* cleaning with Kimwipes™ and isopropyl alcohol.

Finally, after each strand is cleaned and dried, the strands are coated with baby powder to ensure that the 250 µm strands will more easily slide into the kit's 900 µm tubes. The breakout kit end is secured in an assembly, butted against the tubes, and the point at which the jacket is removed should

PHOTO SIX A

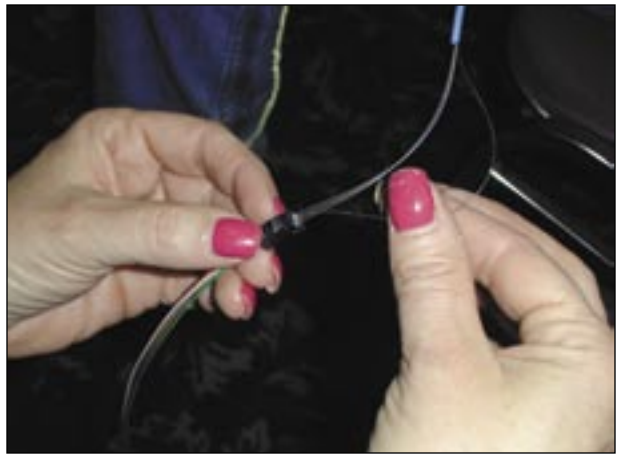


PHOTO SIX B

PHOTO SEVEN

be filled with silicone sealant and covered with heat shrink tubing. **(PHOTOS SIX-A AND SIX-B)**

To complete a termination—depending on the manufacturer—the fiber connector will commonly require a 3 mm sleeve or strain-relief boot to slip over the 900 µm spaghetti tube.

However, breakout kits are *not* required for mechanical or fusion splicing. A common cost-effective method is to eliminate the furcation kit process by splicing the loose-tube's 250 µm strands onto pre-terminated 900 µm 'pigtails' assemblies or directly onto fire-rated indoor tight-buffered, distribution non-breakout fiber cable. **(PHOTO SEVEN)**

Taking into consideration the combined cost of the breakout kits, consumables, and the labor to prepare loose-tube cables for termination can be very costly.

Trouble and cost can dominate an installer's life if just one strand of the six tubes is damaged during the preparation process. All kits must be removed, the cable re-cut (hoping there is enough cable slack) and the whole process has to start again from the beginning.

In the 1980s, Optical Cable Corporation (Roanoke, Va.) pioneered the use of a specialized, tight-buffered jacketed, military tactical cable for moderate-distance LAN OSP installation environments. Its claim has always been that tight-buffer has a clear advantage over loose-tube:

- Indoor/outdoor versatility with optional fire-rating
- Proven military application
- No gel—using dry, water-blocking technology
- Easier to terminate—no breakout kits or splicing required
- Lower installation cost

All contractors and installers are concerned mostly about project costs. OSP tight-buffer cable design is an attractive alternative to the costs of preparing traditional gel-filled cables. This technology has had great success with installers and has had an impact in the marketplace.

In the next issue: The controversy—and applicable standards.

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