

OSP Fiber: Dry or Gel-Filled Loose Tube Construction Which is Right for Me?

Gel-free, or “dry” loose tube construction has been one of the most well-received product developments in the recent history of outside plant (OSP) fiber cable. Technicians appreciate the “no-mess” construction and telcos of all sizes have embraced the cost savings associated with reduced prep time and clean-up. However, it is prudent to be aware of the limitations as well as the benefits when choosing the appropriate cable construction for a specific application.

In general, most loose tube cables are available in either dry or gel-filled construction. Both construction types pass all the requirements of current industry standards such as ICEA S-87-640, Telcordia GR-20-CORE and RUS PE-90. Both types are designed to withstand the rigors of OSP installation and perform in environmental extremes. The primary difference between the two types of construction is the method used to block water ingress inside the tube(s) containing the optical fiber. While there have been many studies debating the long-term effects of water on optical fiber, industry consensus is that it is best to prevent exposure of optical fiber to water. This is especially important in environments in which freezing may occur, as expanding ice can attenuate or break optical fiber.

Gel-filled tubes prevent the ingress of water by filling all the space inside the tube, not otherwise occupied by fiber, with a non-hygroscopic filling compound – typically a gel. The primary advantage of a gel-filled loose tube is that the gel blocks the entrance and flow of water. Gel also provides an additional layer of protection for the fiber, and acts as a coupling agent to promote some degree of cohesion between the fiber and the tube. This is particularly desirable in central tube cables where there is minimal curvature of the tube to provide coupling. The disadvantage of gel filling compound is that it must be cleaned from the fibers for splicing at the point of fiber access. Luckily, Superior Essex gel-filled tubes feature PFM™ gel which offers quicker access and easier cleanup than other gels commonly used in the industry.

PFM Gel

Superior Essex PFM (Polymer Fiber Matrix) gel is a non-sticky, water-blocking material that possesses unique properties, which reduce the friction between the buffer tube and optical fibers during the tube removal process. This feature results in lower force required for fiber access and faster removal of the tubes from the optical fibers. The PFM gel does not require the use of solvents to clean the optical fibers prior to splicing like conventional gel compounds, which allows for faster installation and clean-up time. Time-study trials, conducted by Superior Essex, show a 66% reduction in time for the tube removal and fiber cleaning process.

Dry tube cables typically address the issue of water ingress by including tapes, foams, strings, among other things, treated with super absorbent polymer (SAP) in the tube with the fiber. The SAP materials do not fill the entire tube as gels do. Rather, in the event of water ingress, some amount of water enters the tube until the SAP absorbs enough of the water to create a gel-like material and block the tube, thus preventing further migration. In optimum conditions, the SAP material will dry and reactivate over multiple cycles, thus potentially providing long-term protection. The advantage of

the dry tube cables is that there is no gel to clean when accessing the fiber. The SAP-treated material can typically be trimmed away with scissors. The disadvantage of dry tube cables is the inconsistent performance of SAP.

With uncontaminated fresh water, SAP functionality is very reliable and repeatable. However, as water contamination level rises, SAP performance decreases, both in initial performance and with repeated exposures. A common laboratory experiment is performed with water containing 3% salinity (approximating that of average seawater). Gel-filled tubes continue to block the 3% salt water, but dry filled tubes are less effective. The dry filled tubes pass all industry specifications of course, but there is a significant difference in the level of performance.

There is no cable that is universal for all applications. Specific applications require specific performance. The features and benefits of dry tube cable make it an excellent option for many optical fiber applications. The same can be said for gel-filled tubes. It is important to be aware of the comparative performance of each when determining the best cable for the application at hand. With that in mind, Superior Essex offers the following suggestions:

Superior Essex Dri-Lite® Loose Tube and Ribbon Cable:

Underground, direct buried and aerial applications where:

- Water contact is expected to be intermittent or negligible, and
- Water contamination level is expected to be low and
- The quickest fiber access is desired.

Superior Essex Loose Tube and Ribbon Cable with PFM Gel:

Underground, direct buried and aerial applications where:

- Water contact is expected to be frequent or constant or
- Water contamination level is expected to be high (consider areas such as coastlines, flood prone, heavy road salt, etc.).

Superior Essex offers a complete line of communications products to meet the current and evolving needs of our customers. We strive to help our customers select the right product for the job to ensure successful installation and long term performance.