FIBER BROADBAND 101 SERIES:

Application Considerations for Aerial Fiber Drops

Fiber Broadband ASSOCIATION

When fiber leads, the future follows.

Once-in-a-lifetime funding will soon help service providers deliver more fiber to rural America. The longer routes and lower population densities which make these customers difficult to reach merit a fresh look at network design. But certain technical points need careful attention. This paper outlines technical considerations that affect long-term network reliability for aerial networks.

MECHANICAL RELIABILITY

The mechanical reliability of optical fiber is conservatively estimated at 40 years or more when mechanical strain is properly limited [1,2]. These limits are clearly defined in industry standards [3,4] and are a primary consideration when designing optical fiber cables. However, these limits may be exceeded if a cable is used inappropriately. A good analogy for this is an automotive tire. Under normal conditions, a quality tire can last 50,000 miles or more. However, the performance and service life of a tire can be drastically reduced if it is overloaded or underinflated.

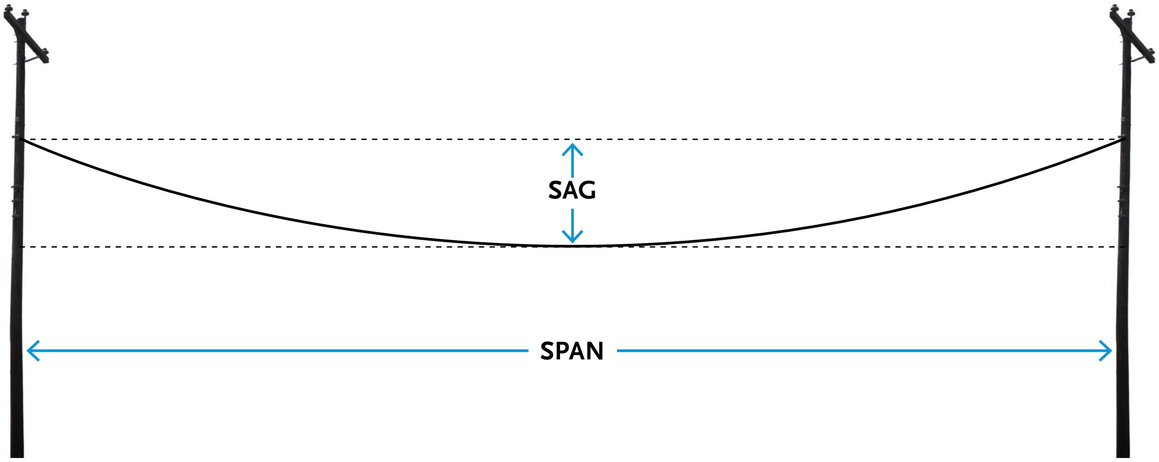
Aerial self-supporting cables are designed for specific limits, including weather load [5], installation sag, and maximum span length. If these limits are exceeded in the field, optical performance and lifespan may be degraded. Low cost and ease of installation make so-called “flat drop” [6,7,8] very appealing for long, rural routes (photo available in references). Unfortunately, rural pole spacings are often much longer than the maximum span ratings of these drops (e.g. 150 feet under standardized, worst-case conditions). Network operators are urged to carefully review performance specifications and strain ratings to ensure proper cable selection.

SAG RATINGS

The sag of an aerial span is the vertical distance between the lowest point of the cable span and a straight line between the two attachment points at the ends of the span. Because sag profoundly impacts cable tension, it is critical to set the sag correctly during installation. Installations with too little sag will result in substantially higher cable tensions.

Aerial conductors are often installed with very little sag. Visually matching the sag of a fiber cable to a nearby conductor may result in over-tensioning of the cable. Consult your manufacturer for detailed span information and clearly communicate it to your installers.

Increasing installation sag will reduce cable tension. Thus, span lengths can sometimes be safely increased by increasing installation sag. However, care must be taken to maintain minimum clearance requirements [5]. Custom sag and tension charts can be provided by your manufacturer.



CABLE TENSION CALCULATIONS

Be sure to obtain cable tension calculations based on the actual conditions in which your cable will be used. In addition to installed sag (see above) this should include the Maximum Span Length and any applied loads (ice, wind, attachments, etc.). This information is critical for calculating pole loadings and selecting support hardware.

SUPPORT HARDWARE

Appropriate support hardware is critical to the reliability of aerial self-supporting cables. Because the cable tension is typically transferred to the hardware through the jacket, cable slippage and jacket tears can be caused by improper support hardware. Improperly sized hardware can also crush and damage the cable or fiber.

Cable tension can increase by 10x during ice or wind events. So, be sure to check hardware ratings against the cable's fully loaded tension specs. Always confirm the compatibility of your hardware and cable with your manufacturers.

CONCLUSION

Long, low-density, rural fiber routes demand careful attention to network design and total cost. Lower material costs are an important element. However, performance specifications should be carefully reviewed to ensure appropriate cable and hardware selection. Installed sag, maximum span length, and applied loads must be accurately defined in the design phase and clearly communicated during construction. Doing so leverages decades of industry expertise, thereby optimizing both cost efficiency and reliability.

REFERENCES

(1) "Fiber Broadband Scalability and Longevity", published by the Fiber Broadband Association Technology Committee, February 2024.

(2) "Design methodology for the mechanical reliability of optical fiber" Glaesemann, Gulati, Corning, Optical Engineering, June 1991.

(3) Generic Requirements for Optical Fiber and Optical Fiber Cable, Telcordia Technologies Generic Requirements GR-20-CORE, Issue 4, July 2013, Telcordia Technologies, Inc.

(4) "Series G Supplement 59, Guidance on optical fibre and cable reliability" International Telecommunication Union, February 2018.

(5) "IEEE C2-2023 National Electrical Safety Code" published by IEEE, 8/2022.

(6) "Corning flat drop SST-Drop™ Outdoor, Single-Tube, Gel-Filled Dielectric Cable with FastAccess® Technology", 3/24. (product datasheet)

(7) "Mini LT Flat Drop Fiber Optic Cable", OFS 07/20. (product datasheet)

(8) "Resilink™ ADF Flat Drop, Dielectric" Prysmian Group 9/21. (product datasheet)

Image of a Typical Flat Drop – Width is approximately 1/3rd of an inch.