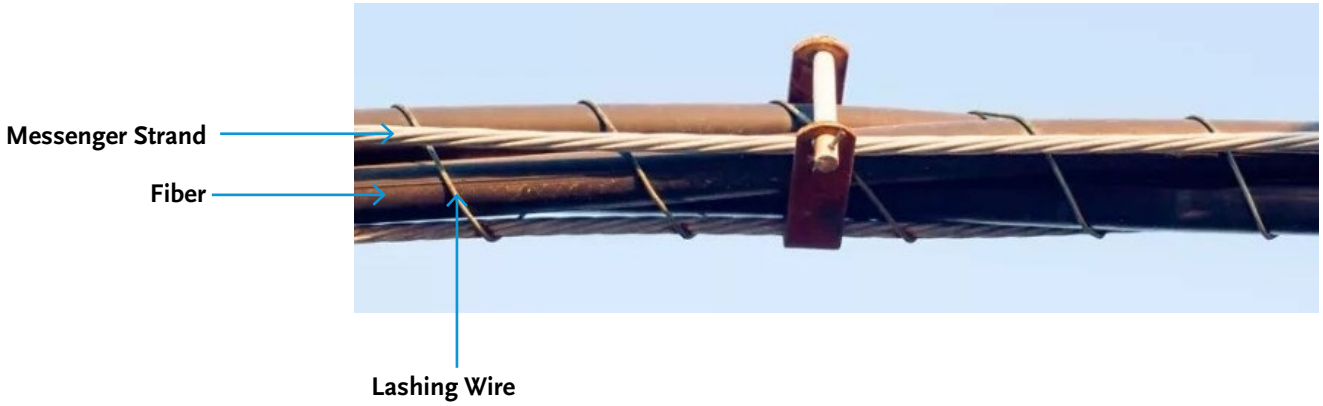
FIBER BROADBAND 101 SERIES

Aerial Fiber Deployment: Messenger Strand and Lashing Wire

Fiber Broadband ASSOCIATION

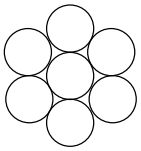
When fiber leads, the future follows.

Messenger strand and lashing wire is a common and reliable method for aerial fiber optic cable deployment. A steel messenger is a stranded steel cable that acts as a support structure to which fiber optic cable is tied (lashed) by way of steel lashing wire. The steel messenger acts as a structure that supports the weight of the fiber. This document describes further details of messenger strand, lashing wire, and the planning and installation process.



MESSENGER STRAND

Steel messenger strand consists of six wires wrapped around a center wire. The most common variety is carbon steel with a zinc coating. The zinc coating provides cathodic protection (CP) to the steel, meaning that red rust is prevented even on the cut ends.



Strands are specified by diameter and strength, with various coating options for each. Some common diameter and strength combinations include:

Diameter (inches)	Strength	Rated Breaking Load (lbs.)
1/4	Extra High Strength (EHS)	6,600
5/16	Utility Grade (UG)	6,000
5/16	Extra High Strength (EHS)	11,200
3/8	Utility Grade (UG)	10,000
3/8	Extra High Strength (EHS)	16,000
7/16	Utility Grade (UG)	16,000
1/2	Utility Grade (UG)	25,000

The coating options include zinc or zinc with 5% aluminum and are categorized Class A, B, and C, where class refers to the amount of coating around each wire. Class B is 2x class A and class C is 3x class A.

For more aggressive environments such as coastal areas and for those wanting to have their infrastructure last longer, zinc-aluminum coatings [1] provide higher corrosion resistance than pure zinc. With the appropriate coating, strands can be expected to survive decades outside [2].

LASHING WIRE

Lashing wire is stainless steel wire in the range of 0.038" to 0.045" [3]. The wire is annealed for high ductility with minimum strengths of 70 to 90 kpsi. The stainless steel grades provide varying strength and corrosion resistance selected based on the size and weight of the cables, and installation environment. The diameters allow different total strength levels at a given corrosion resistance.

To describe the stainless steel grades [4]:

- 430 is for general use in ordinary atmospheric conditions
- 302 is used in corrosive environments and has a higher tensile strength
- 316 is used to provide the best insurance against failure under the most severe atmospheric conditions including chlorides and sulfides

To estimate the amount of lashing wire needed for a single run, take the length of run and add [4]:

- 5% to length for Cable Bundles up to 1.5 in. diameter
- 10% to length for Cable Bundles ranging from 1.5 to 3.0 in. diameter
- 20% to length for Cable Bundles exceeding 3.0 in. diameter

PLANNING PROCESS

There are many considerations when planning a strand and lash fiber installation including: corrosion protection, amount of fiber to be installed, ground clearances, tower spacing, hardware, reserve capacity, tension, slack storage, drop locations, and the state of existing infrastructure. Often this can be determined by reviewing the history of existing installations, local requirements, construction drawings [5], fiber optic cable manufacturer's installation guides [6], and the National Electrical Safety Code (NESC).

For corrosion, look for any history of premature failure due to red rust. Red rust is where the coating has been completely corroded away and the base steel has begun to corrode. This can indicate that a higher level of corrosion protection is needed to extend the life of the messenger strand or lashing wire.

For a span capacity to support fiber, a combination of sag/ground clearances and line tension limits must be considered. There are two tensions to be considered – the tension of the strand and the tension under load of the fiber. There are often local guidelines as to minimum ground clearances. The manufacturer or owner of the fiber will have guidelines as to the maximum tension allowed to reach those ground clearances [6].

Detailed planning can be modeled with available software solutions such as SAG10 or PLS-CADD. These softwares allow for the sag and tension of the line to be modeled against the availability of planned pole spacings and heights and local weather conditions. Planning should also ensure that tension under load for the fiber is considered. After that under stable local conditions and materials, fiber can be installed repeatedly with the same bill of materials. It is possible to add fiber later to an existing span. It is recommended to check back with whomever issued the detailed installation instructions as to whether this will work for the given span. In the worst case, the line can be remodeled to determine if it will support the additional fiber given ground clearance and tension constraints.

DEPLOYMENT PROCESS

Considering a new messenger set-up is required. The first step beyond planning is make-ready, making the infrastructure ready to hold the new lines. After checking existing installment, a crew is tasked to replace any failing hardware, move existing transformers and wires, install new anchors, and otherwise update the infrastructure to support more fiber lines [7].

Next a crew comes to install the messenger strand. If the strand is in the power space, it must be bonded at every other pole.

After the strand is installed, a separate crew comes back through with fiber cable and lashes it to the messenger strand using a specialized tool called a lasher. How tightly it is wound can vary from location to location based on environmental conditions, the type of lashing wire, corrosion requirements of the lashing wire, and the size of fiber cable being installed. A crew may opt to double lash providing increased resistance to vibration or other stresses [6]. These details are typically governed in requirements documents.

The aerial construction video from the following site shows the process:
https://dycomind.com/what-we-do/wireline-construction/

Messenger strand supports a wide variety of fiber cables including standard loose tube and ribbon cables. If demand grows at a later date, new fiber cables can be lashed on top of each other. In addition, slack storage, drop cables, access points, and other hardware can be incorporated mid-span [8].

CONCLUSION

Messenger strand and lashing wire creates a flexible infrastructure, allowing numerous cable designs as well as later additions for new fiber connections. Once strands are placed, fibers can be attached up to the maximum load allowed by the system. There are numerous options for strength, size, and corrosion protection to best fit different local environments.

REFERENCES

(1) What Is Bezinal® Coating? - Bekaert.com

(2) Outside Plant Corrosion Considerations, Rural Utility Service, September 1993

(3) Lashing wire - Bekaert.com

(4) GM_5642.QXD (gmptools.com)

(5) TFO3_000000.dgn (tn.gov) Example construction drawing

(6) Lashed Aerial Installation (corning.com)

(7) Construction Process | CVEC (mycvec.com)

(8) Don't Leave It Up in the Air | ISEMAG, August 2019