Introduction

The purpose of the cable construction is to protect the fiber optic cables during transport, storage, installation, and operation. During each of these phases, the cable is exposed to various influences, e.g. mechanical stress, different temperatures, humidity and sunlight.

So a cable for underground installation is not suitable as an aerial cable. The cable construction and materials have been selected suchlike that the specified transmission characteristics are guaranteed over the entire service life.

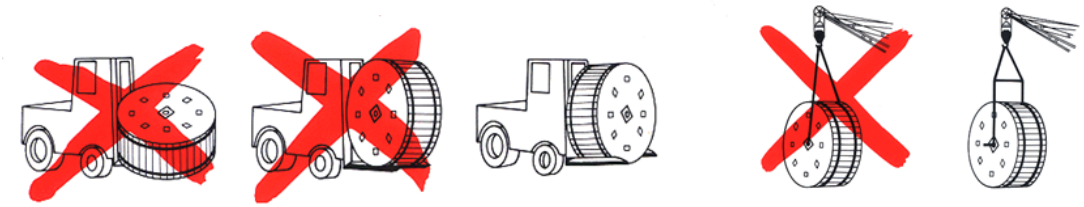
The transmission properties, however, are not only ensured by the cable construction itselfes, but also by the quality of the cable laying or installation.

General information

Cables stored unattended should be protected against vandalism and other possible damage.
If the installation is interrupted, e.g. overnight, the cable ends must be protected against moisture. An appropriate warning tape should be used with the installation. Local instructions and specifications of the client are to be taken into account.

Transport and storage

Cable drums must be handled with care during loading and unloading. The loading of the drums must only be carried out with suitable industrial trucks or a crane. The drums are to be inspected for damage (e.g. broken flange, protruding nails, etc.) in order to avoid subsequent cable damage during the installation. Before transport or when interrupting work overnight, make sure that the outer end of the cable is properly fastened.



Cable drums with fibre optic cable may only be transported standing up. The rolling direction must be observed (arrow on the drum) in order to prevent the winding package from loosening.
The cables must be fastened during transport (load securing).

It is recommended that the cable be protected from continuous sunlight during prolonged storage.
The cable ends must be protected from penetrating moisture with suitable caps.

Installation instructions

The cable data sheets must be observed. They contain all important information for installation:

- Minimum bending radius with and without tensile load
- Maximum pulling force

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- Minimum and maximum installation temperature
- Maximum crush resistance

The permissible bending radius depends on the cable construction. Compliance with the minimum bending radii protects the cable construction from damage caused by too tight bends during installation and subsequent operation, thus ensuring long-term operational reliability.

Important: When using rollers for deflections, each individual roller must meet the minimum bending radius requirements.

The maximum permissible tensile strength is defined by the strain relief elements in the cable and is specified in such a way that the fibres do not undergo any permanent elongation until the maximum force is reached. This can lead to damage to the fibre.

The minimum and maximum installation temperatures are the temperature of the cable and not the ambient temperature is meant. This means that the cable can be warmed up in advance for laying at low temperatures or cooled down if the temperature is too high. The warm-up or cooling phase can last from a few hours to up to 24 hours, depending on cable type, cable length and drum size.

Excessive transverse pressure can damage the cable core and negatively affect the service life of the fibers.

Direct cable laying in the ground

If cables without cable protection conduit are laid directly in the ground, it must be ensured that the cables are installed in a stone-free sand bed. The correct distance to other supply lines or cables must be maintained.

Cable ploughing

Fibre optic cables that are ploughed in must be suitable for this purpose.

Cable Installation in protection tubes (ducts)

If cables are pulled in, it must be ensured that all strengthen elements are equally involved in the pull. The cable stockings must be adapted to the respective cable type (tensile force, diameter).
In the case of stranded cables without glass or aramid rovings above the cable core, the central support element must be involved in the pull.

Tension-resistant caps can be offered as an option.

Important: Pulling devices must be equipped with a tensile force limiter which interrupts the pulling process when the maximum tensile force is exceeded. The tensile forces must be documented throughout the entire pulling process.
To avoid torsion, low-torsion traction cables and rotary shackles must be used.
If cables are not pulled in directly from the drum, the cable must be laid out in figure eight.

Here, the permissible bending radii must be observed.

Wrong

Right

When using lubricants, it must be ensured that they are approved by Deutsche Telekom (ZTV-TKNetz Part 40) or at least equivalent.

The use of mechanical „figure-eight machines“ is often problematic because many machines do not keep the bending radius

Cable blowing

The alternative to pulling in cables is to insert them using the blow-in technique. Consider that not every duct is suitable for every type of cable. Duct and cable diameters must be compatible with each other. Due to their design, micro cables are only suitable for use in micro tubes.
With the blow-in technology, already occupied standard tubes can be equipped with a second, possibly even with a third cable (applies only to standard cables with sheath thicknesses > 1 mm). With second and third cables, however, the expected blow-in length is shorter.

With modern blow-in systems, cable lengths of several kilometers can be injected, depending on the routing. The result depends on the correct adjustment of the entire injection equipment (blow-in jets, cooler, compressor) on the cables to be blown in and to a large extent also the qualification of the operating personnel. Therefore we recommend the training of the personnel with the respective equipment manufacturer.

Before the actual injection begins:

- the pipe system should be checked with a caliber,
- a sponge must be blown through the tube for cleaning and pre-greasing. Ensure the correct dosage of the lubricant (observe manufacturer's instructions),
- the crash test must be carried out. The crash test determines the maximum contact pressure of the blowing device

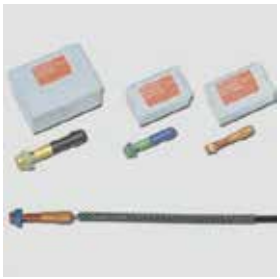
Important: The simultaneous addition of lubricant during the blowing process must only take place behind the drive (worm, drive wheel) of the blowing unit.

For each cable diameter there are injection tips which round off the cable tip. The use of these tips is obligatory.

Special attention is paid to blowing cables with a central loose tube into the duct. These cables are actually not stiff enough for the large pipe diameters to produce acceptable blow-in lengths. To increase the injection performance, tools must be used. In order to increase the blowing performance, aids must be used.

Sonic heads are available in different sizes for the respective pipe diameters. With the help of sonic heads blow-in lengths of 2 km are possible for cables with central loose tube.

Example sonic head:



Source: Vetter Kabelverlegetechnik

Aerial Cable

Air cables are specially designed to be suspended from masts. The construction takes into account the increased tensile forces as well as additional loads such as wind and ice loads. Air cables are always suitable for a project because the conditions at different locations are not the same. The aerial cable must have the strain relief elements consist of aramid yarns. Glass rovings must not be used.

When laying air cables, care must be taken to maintain the maximum tensile forces as well as the compliance with the specified minimum bending radii. This applies in particular to multiple rollers, where each individual roll must meet the requirements for the minimum bending radius.

In addition, the fittings used must be adapted to the cable. Incorrectly fitting Fittings can reduce the service life of the cable and, last but not least, can also pose a risk due to sagging or even falling cables. Preformed spiral fittings are recommended, as these offer a very good fastening with a low cable load.

Source: KABELWERK RHENANIA GMBH