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Optical Cables Installation Guide

This document does not replace the relevant rules or specific standards and regulations for the installation of fiber optic cables. It serves as a recommendation for individual steps performed during the installation of optical cables.

It should be noted that with optical cables, any potential damage caused by improper installation may not be apparent immediately, but only after a longer period of time. Most often, damage to the cable manifests itself in the deterioration of transmission parameters, or the complete loss of continuity of the optical fiber.

Used symbols:

✓ Recommended

✗ It is not recommended, there is a risk of irreversible damage to the cable

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General

- Before installation, create a detailed plan that includes cable routes, connection points and equipment locations. Consider factors such as cable length, bend radius and environmental conditions.
- Cable installation should be performed by trained personnel only.
- Always use only cable constructions suitable for the conditions at the installation location.
- For the installation of the cable, it is always necessary to use an installation technique that is suitable for its construction.
- Fiber optic cables should be placed in their own dedicated raceways or trays. Do not combine copper cable and fiber optic cable in the same raceway or tray.
- For harsh environment, preferably use cables with loose tube secondary coating.
- Never pull directly on fibres or subunits with fibres. Always use tensile members.
- If the cable construction is not directly intended for installation by pushing, install the cables by pulling. Pushing can cause the bend radius to be unexpectedly exceeded and thereby damage it.
- The pulling force must be continuously uniform.
- Divide long routes into smaller sections by locally winding the cable using the "figure 8" method (see below)
- Create enough service loops in the cable route.
- When installing the cable into the duct, use lubricant to reduce the coefficient of friction between the outer surface of the cable and the inner surface of the duct.
- For air-blowing installation, first calibrate the duct and check that the lubricant used is compatible with the cable jacket material.
- The cable route must be inspected prior to installation to ensure that it is free of obstacles or impurities. In the case of installation in very long pipelines, it is advisable to use a camera system for inspection.
- Cable unwound should only be carried out within the installation temperature range specified in the specification. If the cable is unwound in an ambient temperature below 5°C, the cable must be stored on the original drum in an environment with a temperature above 20°C for at least 24 hours before unwinding. Subsequently, the cable must be unwound within 2 hours at the latest.
- ATTENTION! Due to direct sunlight, some cable sheath materials can reach significantly higher temperatures than the ambient air temperature.
- During installation the cable drum must rotate freely and smoothly.
- The cable should be unwound from the upper side of the drum.
- When unwinding the cable, it must not be deflected beyond the inner width of the drum, twisting, abrasion, forming loops, or other mechanical damage.
- Never unwind the cable over the side of the drum.
- The maximum tensile strength and specified bending radius must not be exceeded in the entire cable route. To measure the tensile force, it is recommended to insert a tensile force gauge in one line with the cable, ideally with a recording device for back-checking.
- In places where the cable is accessible during installation, check the visual condition of the cable jacket for damage.
- Immediately after installation, secure the ends of the cable against the penetration of moisture, even if the cable will still be handled.
- In case of any non-standard events during the installation, we recommend immediately stopping the installation and performing an OTDR control measurement.
- If the fiber optic cable contains metallic elements, these elements must be properly grounded.
- For later assessment, we recommend documenting the progress of the entire installation in the final report after the installation is complete. The document should contain the identification of the cable, a description of the installation, the conditions under which the cable was installed, a measurement protocol and proof of the maximum mechanical stress on the cable during installation. Everything should be accompanied by appropriate images and video.

Cable Tensile Strength

The cable tensile strength value represents the highest load or tensile force that can be exerted on the cable. This is not the physical strength of the cable, but the permissible limit before any mechanical damage to the fibers or their optical properties occurs.

For optical cable are used two values of tensile strength:

- Short-term (installation)
- Long-term (operating)

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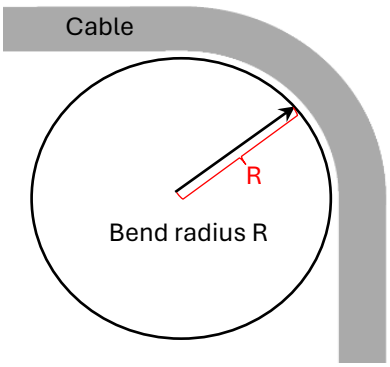
- These values are different and depend on the cable construction.

The installation tensile strength is the maximum value that the cable can be temporarily loaded during installation and must never be exceeded! The cable should be pulled by hand as much as possible. If mechanical devices are used for pulling, the pulling strength must be always monitored.

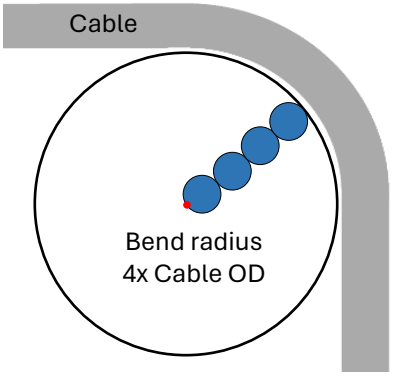
The operation tensile strength is the maximum value that the cable can be loaded with in the long term during the operation of the cable. Despite this permissible load, we recommend keeping the installed cable as far as possible without load or far below this value.

Bending Radius

The minimum bend radius is the value of the smallest bend at which excessive attenuation does not occur in the fiber. Never exceed this value. The fiber is very strong when stretched straight, in bending strength of fibre decreases. The minimum bend radius has two values, for installation and operating. The installation bending radius is a higher value, because the cable is additionally stressed in tension in its bend. After installation and release, the cable is able to withstand a smaller bend radius. Failure to comply the minimum bending radius may result in damage to the fibers in the cable, or an increase in attenuation without visible physical damage to the cable.



Calculation example (Cable D = 6.5 mm):
Cable bending radius 4xD = 4 x 6.5 mm = 26 mm



Compressive Loading

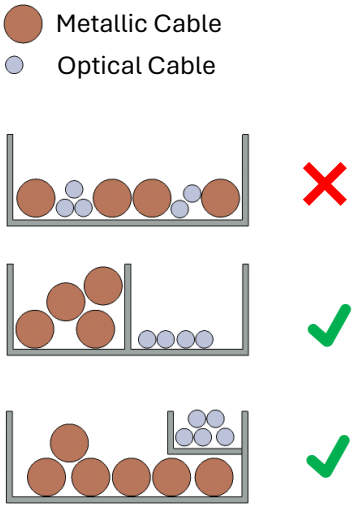
Compressive resistance is the ability of the cable to withstand the effects of lateral pressure without changing its parameters, or to restore its original parameters after the cable releasing.

Impact Resistance

Impact resistance is the ability of a cable to withstand the effects of repeated impacts without loss of transmission parameters.

Cable Installation On Tray

Do not install fiber optic cables in raceways and trays together with copper cables to avoid excessive stress or twisting. Always place them separately.



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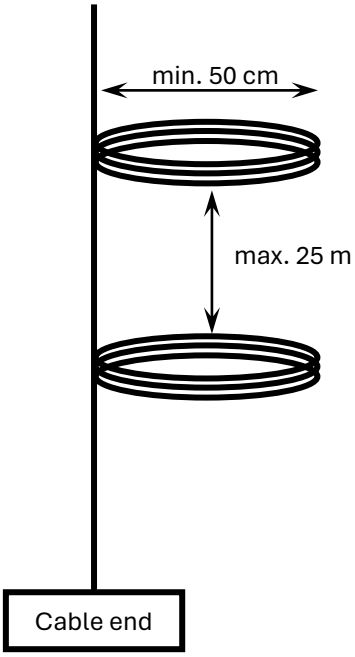
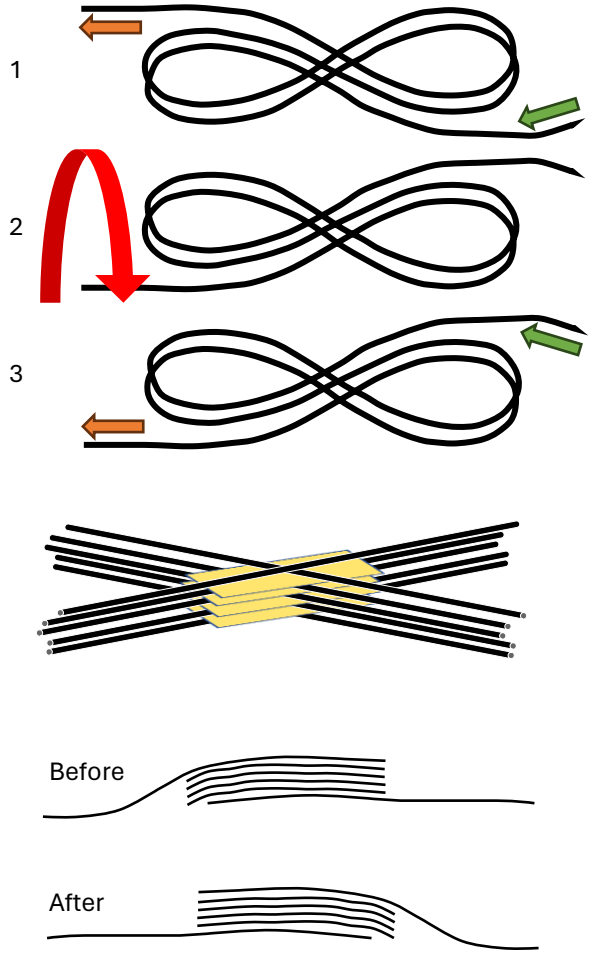
Vertical Cable Installation

Optical cables containing gel can easily be installed vertically in high-rise buildings without the gel dripping from the cables. Currently, the gel is resistant to drip up to a temperature of +70°C. No filling gel will leak from the cable if the cable is looped every 20-25 m in 3 loops with a diameter of at least 50 cm (taking into account the minimum bending radius of the cable). These loops also prevent the so-called vertical drop of the cable to the lower end.



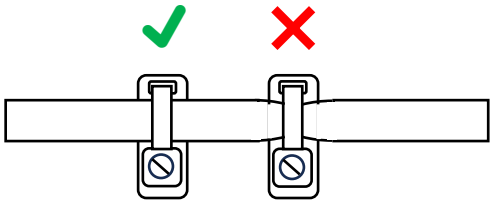
Local Cable Winding

For local cable winding, use the figure “8” loop method



Cable Clamps

Fasten the cables with clamps with a large area. Avoid pinching or squeezing the cable. Cable clamps should be hand-tightened with low pressure.



Cable Routing In a Duct

When pulling the cable out of the pipe, try to make sure that the cable comes out in a straight direction. Pulling at an angle can damage the cable.