Fiber Optic Cable Construction

A main purpose of a fiber optic cable is to protect the fiber core inside the cable that carries the light signal transmission. The following diagram shows the construction of a fiber optic cable.

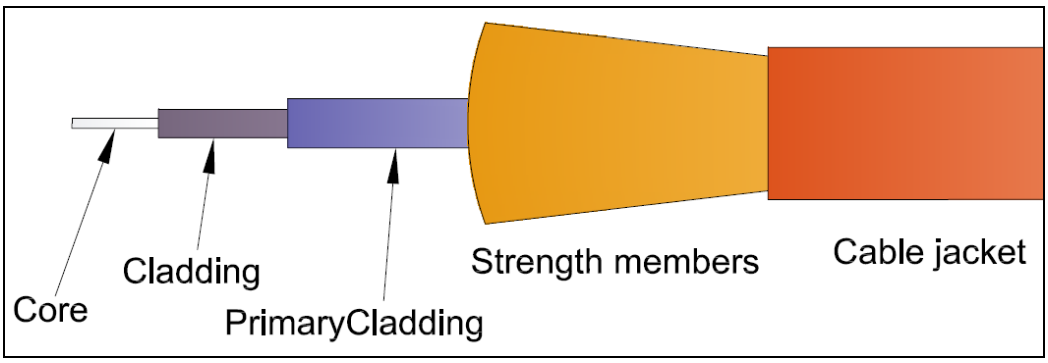

Diagram-1: Typical fiber optic cable construction

Core

The fiber core is made of silica glass and is the central part of the fiber optic cable that carries the light signal. They are hair-thin in size and the diameter of the fiber core is typically 8 µm for single mode fiber, and 50 µm or 62.5 µm for multi mode fiber.

Cladding

The cladding is also made of glass, and is the layer that surrounds the fiber core. Together, they form a single solid fiber of glass that is used for the light transmission. The diameter of the cladding is typically 125 µm.

Primary Coating

After the cladding, there is the primary coating that is also known as the primary buffer. This layer provides protection to the fiber core and cladding. They are made of plastic and only provide mechanical protection. They do not interfere with the light transmission of the core and the cladding.

Strength Members

The next layer is strength members. They are strands of aramid yarn, or better known as **Kevlar**. They are added to the fiber optic cable to prevent the breakage of the fiber glass during installation. When fiber is pulled through a duct, the outer cover would stretch and the pulling load would be rested on the fiber. The strength members prevent this as their material is designed to take the strain.

Cable Jacket

The last layer is the cable jacket, which are comprised of different materials depending on the choice of the end user and the application in use. Like the primary coating, they serve only as a mechanical protection to the fiber core and cladding inside. Common types of fiber optic cable jacket ratings are:

- **OFNP** (Optical Fiber, Nonconductive, Plenum)
- **OFNR** (Optical Fiber, Nonconductive, Riser)
- **LSZH** (Low Smoke Zero Halogen)

CABLE JACKET RATINGS

OFNP

OFNP (optical fiber, nonconductive, plenum) are used in plenum applications. They are used inside buildings in plenum areas, the areas between a ceiling and the floor above it, where space is reserved for the circulation of air. They have the highest rated fire retardant where it emits little smoke during combustion. The nonconductive element within OFNP means they contain no electrically conductive components.

OFNR

OFNR (optical fiber, nonconductive, riser) are used in riser applications. These are spaces inside a building in pathways that pass between floors, such as a vertical zone or space. They are engineered to prevent fire from spreading from floors to floors within buildings.

LSZH

LSZH (low smoke zero halogen) cable jackets are composed of fire retardant materials that reduces the amount of smoke emitted when combusted. A feature in LSZH is that they contain zero halogen during combustion. They have been cited as an ideal cable jacket in high risk areas of fire or crowded public locations.

There are different reasons for light losses which may occur during transmission of light signal inside the fiber or during the interconnection process of two fibers.

CABLE STRUCTURE

There are two basic designs in terms of construction for fiber optic cables: loose-tube and tight-buffered. Both cable designs could be used both indoor and outdoor, but they are more popular within each setting. Loose tube cables are used in many outside plant installations while tight buffered cables are used often inside buildings. Each type of cable are beneficial in different applications, implying that there is no “one-cable-fit-all”.

Loose-tube cables

In loose-tube cables, color-coded plastic buffer tubes house and protect optical fibers, a gel filling compound impedes water penetration. The main feature is that the fiber is available to be freely moved. This is beneficial as there is less strain and allows fiber to expand and contract with respect to the changes in temperature. In addition, they have better bending performances as the fiber inside can wander inside the loose tube cable. Finally, they are also beneficial during installation where they can be stretched more without stressing the optical fiber.

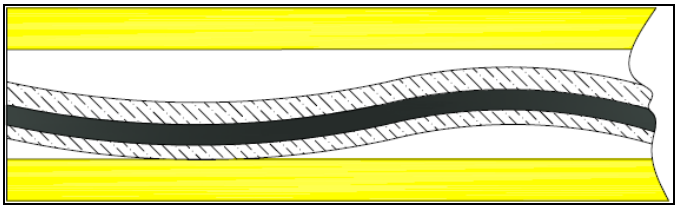

Diagram-2: Loose-tube fiber optic cable

Tight-buffered cables

In contrast to loose-tube cables, tight-buffered cables have the buffering material in direct contact with the fiber and tightly wraps around the optical fiber. They provide a rugged cable structure for better mechanical protection of fibers during handling and installation. The strength members or aramid yarn Kevlar are placed either after the outer cable jacket or around each individual fiber optic jacket, often referred to sub-jackets.

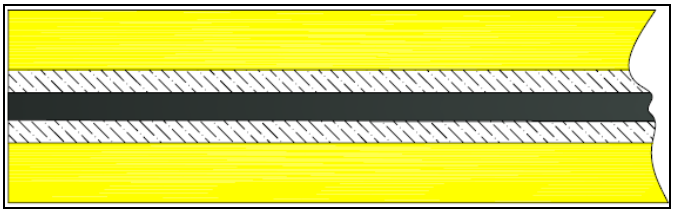

Diagram-3: Tight-buffered fiber optic cable

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