COETZER OPTICAL SYSTEMS (Pty) Ltd

Structure of Outdoor Optical Cables for Communication

Overview

Anatomy of Outdoor and Indoor Optical Fiber Cables – MapYourTechToday, we're diving into the structure of two common types of optical fiber cables, as depi.

Key Takeaways

Outdoor optical cables are designed with multiple protective layers, including optical fibers, water-blocking materials, reinforcement, and outer sheaths, to ensure reliable data transmission in harsh environments.Core Components
• Optical Fiber: The central element that transmits data as light pulses. Fibers are typically made of high-purity glass or plastic and can be single-mode or multi-mode, supporting high-speed communication over long distances .

• Central Strength Member: Provides mechanical stability and resists tension during installation. Materials include steel wires, fiberglass reinforced plastic (FRP), or aramid yarn (Kevlar equivalent) for tensile strength .

• Buffer Tubes and Filling Material: Fibers are housed in loose or central tubes filled with water-blocking gel or dry water-blocking materials to prevent moisture ingress and protect fibers from physical stress and temperature-induced expansion or contraction .

• Reinforcement Layers: Additional layers of steel wire, FRP rods, or aramid yarn enhance mechanical strength, crush resistance, and bending performance, especially for aerial or direct-burial installations .

• Sheath: The outer protective layer, usually made of polyethylene (PE) or flame-retardant low-smoke zero-halogen (LSZH) materials, shields the cable from UV radiation, moisture, abrasion, and environmental hazards .

• Optional Armor and Shielding: Some outdoor cables include aluminum tape or steel armor for electromagnetic interference (EMI) protection and additional mechanical defense, particularly in direct-burial or industrial environments .

Common Outdoor Cable Structures

• Central Tube Cable: Fibers are placed in a central high-strength tube with gel filling, surrounded by reinforcement and a protective sheath. Compact and lightweight, suitable for medium- to short-distance networks with fewer cores (12–48 fibers), .

• Stranded Loose Tube Cable: Multiple loose tubes are helically wound around a central strength member. This design supports high fiber counts (12–144 fibers), long-distance transmission, and high tensile strength, making it ideal for backbone networks .

• Skeleton Cable: Features a plastic skeleton with spiral grooves where fibers are embedded directly, eliminating loose tubes. Offers excellent compression and bending resistance for complex mechanical environments .

• Aerial Cables (ADSS): All-dielectric self-supporting cables designed for installation on poles or power lines without metal content. Reinforced with aramid yarn and FRP rods, they resist wind, UV, and electrical interference .

• Direct-Burial Cables: Armored with steel or aluminum tape for protection against moisture, rodents, and mechanical damage. Suitable for trench installations in harsh outdoor conditions .

Summary

Outdoor optical cables are engineered to withstand environmental extremes such as UV exposure, temperature fluctuations, moisture, wind, and mechanical stress. Their multi-layered structure—comprising optical fibers, buffer tubes, water-blocking materials, reinforcement, and protective sheaths—ensures reliable communication over long distances. Selection of the appropriate cable type depends on installation method (duct, aerial, direct burial), fiber count, and environmental challenges .

Article Content

Complete Guide to Fiber Optic Cable Construction

This guide explains the structure of fiber optic cables, the most common cable constructions used in the industry, and how to choose

Handbook Optical fibres, cables and systems

The simultaneous availability of compact sources and of low-loss optical fibres led to a worldwide effort for developing optical fibre

Outdoor Communication Optical Cable

Outdoor communication optical cables are specialized fiber optic cables engineered for durability in external environments. These

Outdoor Fiber Optic Cable | Outside Plant Fiber (OSP) Cable

Fiber optic cables for outdoor applications are engineered to withstand the more demanding conditions seen outside, from

Fiber 101

II.2 Optical Fiber/Cable In this section, we discuss the structure and properties of an optical fiber, how it guides light, and how it is

BASICS OF OPTICS AND OPTICAL FIBER COMMUNICATION

Overview Of Optics And Optical Fiber Communication: Topic Covered: History of fiber optic systems, block diagram, Fiber material,

Principles of Optical Fiber Communications

The additional elements such as fiber and cable splicers and connectors, regenerators, beam splitters, and optical amplifiers are

Outdoor Fiber Optic Cables: Basics & How to Choose (2023)

Discover the differences, types, and applications of outdoor fiber optic cables in this comprehensive guide. Learn how to select,

Outside Plant Fiber Optic Cable

Installing on poles can be quick and cost effective, but rights-of-way can be difficult to obtain. Cable is suspended between poles or

Outdoor Fiber Optic Cable | Outside Plant Fiber (OSP) Cable

These are the outdoor fiber optic cables you see strung along telephone poles (aerial), installed inside an underground duct, or even

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