

Material Requirements for Communication Optical Cables



Overview

ITU-T has been active in the standardization of optical communications technology and the techniques for its optimal application within networks from the infancy of this industry.

Key Takeaways

High-quality optical fiber cables require ultra-pure silica cores, protective coatings, strength members, water-blocking elements, and durable outer jackets to ensure reliable, long-distance communication.

Core and Cladding

The core and cladding are made from ultra-pure silica (SiO_2), often doped with germanium to control the refractive index, which is essential for efficient light transmission and minimal signal loss. Single-mode fibers typically have a core diameter of 8–10 μm , while multimode fibers range from 50–62.5 μm .

Coatings and Identification

Fibers are coated with dual-layer UV-cured acrylate, consisting of a soft primary layer and a hard secondary layer, to protect the glass from mechanical stress and environmental damage. UV-cured color inks are used for fiber identification, following standard color codes for easy installation and maintenance.



Strength Members

To prevent elongation and maintain structural integrity, cables include strength members such as aramid yarn (Kevlar®), fiberglass reinforced plastic (G-FRP), or steel wires for armored cables. These materials provide tensile strength and protect fibers during installation and operation.

Tube and Filling Materials

Loose tubes are often made from polybutyleneterephthalate (PBT), and tube filling compounds like thixotropic gels are used to prevent water ingress and maintain fiber stability. Water-blocking yarns and water-swellaable tapes made from polyester and super-absorbent resins further enhance moisture resistance.

Binder and Ripcord

Binders, typically polyethylene terephthalate (PET) yarn, hold the cable structure together, while ripcords made from high-strength tear-resistant materials allow easy jacket removal during installation.

Outer Jacket

The outer jacket protects the cable from environmental hazards such as UV exposure, moisture, and mechanical stress. Common materials include high-density polyethylene (HDPE) for outdoor use and specialized plenum-rated polymers for indoor applications. The jacket type must match the installation environment and comply with local fire and safety codes.

Additional Considerations

Some cables include metallic components for grounding or chemical insulation, and proprietary additives like glass flakes or borates may be used to enhance performance in specific conditions. Proper material selection ensures long-term reliability, with cables designed to maintain performance over 30–50 years under varying environmental conditions. By carefully selecting these materials, manufacturers ensure that optical fiber cables deliver high-speed, low-loss, and durable communication suitable for telecommunications, data centers, broadband, and industrial applications.

Article Content

Handbook Optical fibres, cables and systems

ITU-T has been active in the standardization of optical communications technology and the techniques for its optimal application within networks from the infancy of this industry. However, it is not always

What Are the Raw Materials of Fiber Optic Cables? Full Guide

A complete guide to the raw materials of fiber optic cables—optical fibers, PBT tubes, FRP rods, aramid yarn, steel armoring, HDPE/LSZH jackets, and more. Compare ADSS, OPGW,

A Guide to the Materials used in Fiber Optic Cable Manufacturing

Want to understand optical fiber cable construction? This guide covers materials, installation, and best practices for optimal network performance.

High-Quality & Standard Raw Materials Of Optical Fiber Cables

The use of high-quality and standard raw materials allows fiber optic networks to deliver reliable, high-speed communication over long distances and under various environmental conditions.

What Materials Are Fiber Optic Cables Made Of?

Fiber optic cables are made up of a core, cladding, and protective layers, with materials chosen based on the application requirements.

Understanding and Selecting Optical Fibre and Cable

In this document, the relationship between the cable features, followed standards, test parameters, and acceptance criteria are explained with examples for a better understanding of an optical fibre cable

CORNING OPTICAL COMMUNICATIONS GENERIC

1.3 Finished cables shall conform to the applicable performance requirements of the Insulated Cable Engineers Association, Inc. (ICEA) Standard for Fiber Optic Premises Distribution Cable (ICEA S-83

A Beginner's Guide to Fiber Optic Materials

The materials used in fibre optic cables let light pass through so that information can be sent. Since each part of a fibre optic cable has an individual function, the materials must be robust,

Design and Critical Process Requirements for Optical Fiber, Optical ...

The design and workmanship of COTS items should be evaluated and modified as required to ensure that the use of COTS in wiring harnesses and cable assemblies meets contract performance and

Optical Data Transmission in Industrial Automation: Why Wires Are ...

When people hear the term wireless communication, they often think of Wi-Fi or Bluetooth. In industrial automation, however, there is another approach designed specifically for demanding manufacturing

Home -The Fiber Optic Association

It is intended to be an introduction to communications technology appropriate for a communications course at almost any level (junior high, high school or college,)

Overhead Optical Cable Construction Guidelines

In the communications industry, how to construct overhead optical cable is a problem that many front-line communications construction workers will encounter.

G.657.A2 Bend-Insensitive Optical Fiber for FTTH & FTTx Networks ...

A2 bending-resistant single-mode fiber solutions, which can be widely used in optical cable manufacturing, FTTH access networks, communication engineering, data centers, high-density

Underground Fiber Optic Cable: The Complete Guide (2026)

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Optical Cable Pricing: Comprehensive Guide to Cost-Effective Fiber ...

Optical cable pricing represents a crucial consideration in modern telecommunications infrastructure, reflecting the complex interplay of manufacturing technology, material costs, and market demand.

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