

Commonly Used Materials for Outdoor Optical Cables



Overview

Proper cable selection is critical to the intended long term performance of the communications network.

Key Takeaways

Outdoor optical cables are constructed from a combination of glass or plastic fibers, protective coatings, buffer tubes, strength members, water-blocking elements, and outer jackets designed to withstand environmental stress.

Core and Cladding

The core of the optical fiber, responsible for transmitting light signals, is typically made from ultra-pure silica (SiO_2), sometimes doped with germanium to control the refractive index. Surrounding the core is the cladding, usually made from fluoride-doped silica, which reflects light back into the core to minimize signal loss. In plastic fibers, materials like acrylate or polyimide may be used for the core and cladding, offering flexibility but shorter transmission distances compared to glass fibers.

Coatings and Buffers

Each fiber is coated with a dual-layer UV-cured acrylate: a soft primary coating to cushion the fiber and a hard secondary coating for mechanical protection. Fibers are often grouped in buffer tubes, which may be filled with water-blocking gel or dry water-blocking materials to prevent moisture ingress. These buffer tubes protect fibers from mechanical stress and environmental factors such as temperature extremes and humidity.

Strength Members

To provide tensile strength and prevent stretching, outdoor cables include strength members made from aramid yarn (Kevlar), fiberglass rods, or FRP (fiber-reinforced plastic). In armored cables, metallic strength members like steel or aluminum may be added to resist rodent attacks, crushing, and other mechanical hazards .

Outer Jackets

The outer protective layer, or jacket, is typically made from high-density polyethylene (HDPE), polybutylene terephthalate (PBT), or polypropylene (PP). These materials provide UV resistance, moisture protection, and durability in extreme temperatures, ranging from -40°C to +70°C. Some jackets may include chemical repellents or glass flakes to enhance longevity and environmental resistance .

Armoring and Specialized Layers

For high-risk outdoor environments, cables may include armoring layers such as interlocking aluminum or corrugated steel tape to protect against physical damage, rodents, and vandalism. All-dielectric self-supporting (ADSS) cables use additional aramid or fiberglass layers to provide tensile strength without metallic components, suitable for aerial installations .

Additional Materials

Other materials may include UV-cured color inks for fiber identification, ribbon matrix resins for ribbon cables, and proprietary micro-additives to improve performance under specific conditions, such as gel-fill stability, low-temperature flexibility, or long-distance blowing during installation . In summary, outdoor optical cables are engineered with a combination of high-purity glass or plastic fibers, protective coatings, buffer tubes, strength members, water-blocking elements, durable jackets, and optional armoring, ensuring reliable performance in harsh environmental conditions.

Article Content

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OUTER JACKET MATERIALS

Please refer to the Product Specifications sections located in the OCC Product Catalog for the various cable types and fiber counts

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The primary materials used for jackets include: Polyethylene (PE): High-density polyethylene (HDPE) is commonly

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