

## Highway Aerial Optical Cable



### Overview

Optical cable designs not specifically addressed by this section may be allowed, if accepted by the Agency.

### Key Takeaways

Highway aerial optical cables are overhead fiber optic cables installed along highways for communication, monitoring, and sensing applications, offering durability, flexibility, and high-speed data transmission.

Highway aerial optical cables are fiber optic cables designed for overhead installation, typically suspended between utility poles, pylons, or towers along highways. They provide high-speed optical signal transmission over long distances and are ideal for areas where underground cabling is difficult or costly, such as highways crossing rivers, uneven terrain, or urban and rural road networks. These cables are engineered to withstand wind, ice, UV radiation, extreme temperatures, and mechanical tension, ensuring reliable performance in outdoor environments.

#### Types of Aerial Optical Cables

Aerial fiber optic cables are generally classified into two main categories:

- Self-Supporting Cables: These cables can span long distances without additional support. Examples include:
  - ADSS (All Dielectric Self-Supporting Cable): Supports its own weight over distances up to 1000 meters and is commonly used on power transmission lines.

- Figure 8 Cable: Features external strength members forming a figure-8 shape, providing high tensile strength and water resistance .
  - OPGW (Optical Ground Wire): Combines optical fibers with a metal ground wire, serving both as a lightning-protection conductor and a high-speed communication channel, often used along high-voltage power lines adjacent to highways .
  - Catenary or Suspension Cables: These rely on an existing messenger wire for support and are suitable for shorter spans or areas with pre-installed infrastructure .
- Applications on Highways

Highway aerial optical cables serve multiple purposes:

- Telecommunication and Data Transmission: Provide backbone connectivity for highway communication networks, traffic management systems, and broadband services .
  - Distributed Fiber Optic Sensing (DFOS): Used for structural health monitoring (SHM), traffic flow analysis, and environmental sensing. Techniques like Distributed Acoustic Sensing (DAS) or Distributed Temperature Sensing (DTS) utilize the fiber to detect vibrations, temperature changes, or strain along the highway .
  - Smart Highway Systems: Enable real-time monitoring of road conditions, bridge integrity, and vehicle movement, improving safety and maintenance efficiency .
- Installation Considerations
- Mounting: Cables are attached to poles, pylons, or existing support structures. Self-supporting cables can span long distances without additional support, while catenary cables require a messenger wire .
  - Cable Type Selection: Depends on the intended use (communication, sensing, or both), environmental conditions, and regulatory requirements. Single-mode fibers are preferred for long-distance, high-bandwidth applications .
  - Strain Management: Loose tube or tight-buffered fiber configurations are used to minimize strain and maintain low attenuation during installation .
  - Positioning: For sensing applications, cables should be placed where maximum deformation or stress is expected, such as bridge joints or high-traffic areas .

Advantages

- Cost-Effective: Lower installation costs compared to underground cabling.
- Flexible Deployment: Can adapt to complex terrains and existing highway infrastructure.
- Durable and Reliable: Designed to withstand harsh outdoor conditions and maintain stable signal transmission over decades . Highway aerial optical cables are therefore a critical component for modern highway communication, monitoring, and smart infrastructure systems, combining high-speed data transmission with robust environmental resilience.

## Article Content

Aerial Cable | Outdoor Cable Technology| Corning

These cables can be installed in short spans between aerial poles without a separate messenger upon which to attach the optical

Recommendation ITU-T L.102 (11/2025)

Cables used along power lines are separately categorized (ADSS, OPGW, OPPC, OPAC, MASS).Optical fibre requirements- Use

The FOA Reference For Fiber Optics -Outside Plant Construction

Polyethylene (PE) is the material of choice for use as an aerial OSP cable jacket. The performance of raw PE can degrade rapidly

Aerial Fiber Optic Cable: What it is and How it Works

Explore the world of aerial fiber optic cable and discover their importance, benefits, hardware, installation techniques, and future

FOSA DFOS Installation Considerations For Highways | PDF | Optical ...

It covers cable types, configurations, deployment methods and considerations for different applications including traffic monitoring,

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Optical cable designs not specifically addressed by this section may be allowed, if accepted by the Agency. Justification for

Aerial Fiber Optic Cable – Types & Installation Tips

Because aerial cables are exposed to harsh outdoor environments and extreme weather conditions, their materials

The FOA Reference For Fiber Optics

Fiber Optic Network Design Jump To: The Communications System Cabling Design Choosing Transmission Equipment Planning

How to Install Aerial Fiber Optic Cable Correctly

How to Install Aerial Fiber Optic Cable Aerial fiber optic cable is typically installed by planning the route, checking pole spacing,

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What Is a Smart Highway? The Road That Bridges the Digital Divide

A first-of-its-kind project for the Arizona Department of Transportation (ADOT), ADOT installed fiber optic cables along

Aerial Fiber Optic Cable Overview and Installation Guide

In addition, aerial fiber optic cable resists environmental concerns such as ever-changing weather conditions in the form of excess

Submarine Cable Map

TeleGeography's comprehensive and regularly updated interactive map of the world's major submarine cable systems

Introduction to Aerial Fiber Cables

Since aerial cables are exposed to harsh outdoor environments and extreme weather conditions, the material used to

Aerial Fiber Optic Cable Overview and Installation Guide

The scene of aerial cables hanging in the pole is ubiquitous in our daily lives. Unlike other common fiber optic cables,

The FOA Reference For Fiber Optics -Outside Plant Construction

Outside Plant Construction Guide Introduction Review Of Fiber Optic Technology. Project Preparation And Guidelines. Underground

Aerial Fiber Optic Cable

Aerial Fiber Optic Cable AFL offers a complete portfolio of fiber optic cable, supporting hardware and compression accessories that

Installation of Corning Optical Communications Self-Supporting

The combination of strand and optical fiber into a single cable allows rapid one-step installation and results in a more durable aerial

Related Video Reference

This video was associated with the source search result. Verify technical details against current product documentation and project requirements.

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