Optical Cable Series Fusion Splicing Method

Overview

Fusion splicing is the most widely used method of splicing as it provides for the lowest loss and least reflectance, as well as providing the strongest and most reliable joint between two fibers.

Key Takeaways

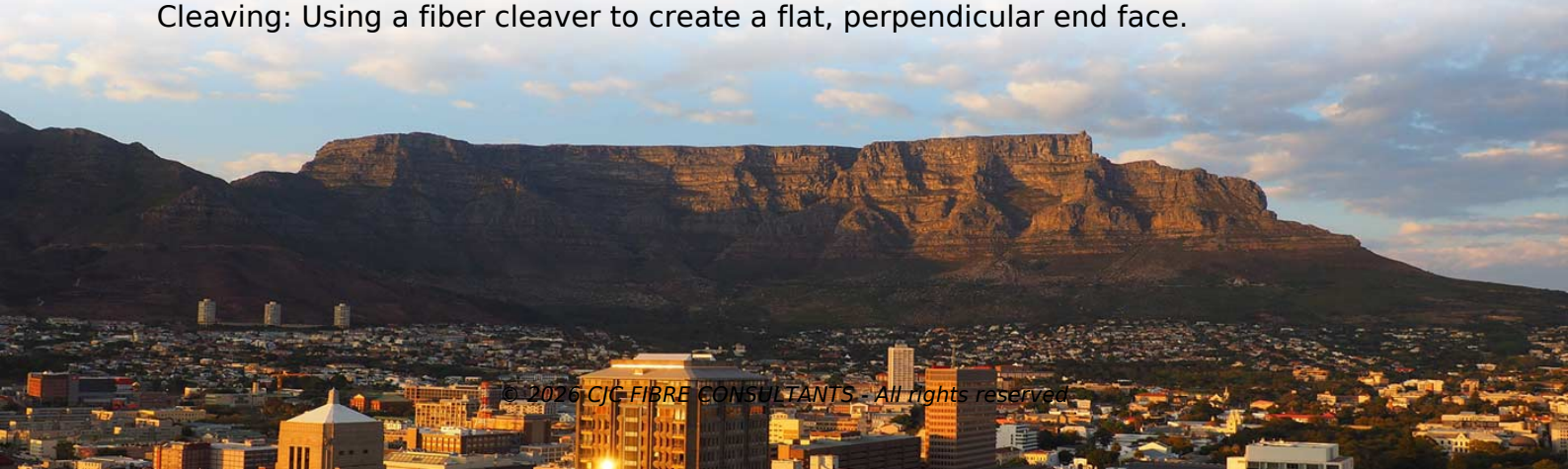
Fusion splicing joins optical fibers end-to-end using heat to create a low-loss, strong, and permanent connection.

Core Principle

Fusion splicing works by melting the ends of two optical fibers and fusing them together, typically using an electric arc as the heat source, though lasers or other heat sources can also be used. The goal is to ensure that light passes through the splice with minimal scattering or reflection, maintaining signal integrity while providing a joint nearly as strong as the original fiber.

Series Fusion Splicing

In series fusion splicing, multiple fibers are joined sequentially along a cable, either as single fibers or as fiber ribbons. The process involves: Fiber Preparation: Stripping the protective coating and cleaning the bare fiber to avoid contamination. Precision Cleaving: Using a fiber cleaver to create a flat, perpendicular end face.



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The quality of the cleave directly affects splice loss. Core Alignment: Aligning the fiber cores is critical. Two main techniques are used: Optical Core (Profile) Alignment: Uses cameras and software to detect the fiber cores and automatically align them with movable stages.

LI

D (Local Injection and Detection) Alignment: Couples light into one fiber and measures transmission through the other while adjusting alignment for optimal light passage. Fusion: The splicer generates an electric arc to melt the fiber ends, fusing them together. The machine estimates splice loss and ensures optimal alignment during the process.

Protection: A heat-shrink sleeve is applied over the splice to protect it from moisture, mechanical stress, and environmental hazards. Ribbon vs Single-Fiber SplicingSingle-Fiber Splicing: Each fiber is spliced individually, suitable for repairs or custom installations. Ribbon Splicing: Multiple fibers (e.g., 12 or more) are spliced simultaneously, improving efficiency for data centers or telecom networks.

Advantages

Lowest optical loss: Typically less than 0. 02 dB for single-mode fibers. Strong and reliable joint: Mechanical strength nearly equal to intact fiber.

Long-term stability: Resistant to environmental factors when properly protected.

Summary

The principle of optical cable series fusion splicing is to sequentially join fibers with precise alignment and controlled heat, ensuring minimal signal loss and maximum mechanical strength. Proper preparation, alignment, and protection are essential for high-quality, low-loss splices in both single-fiber and ribbon configurations.

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Fiber Optic Cable Splicing Explained

Splicing in optical fiber is the joining two fiber optic cables together. There are 2 methods of cable splicing, mechanical or fusion.

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