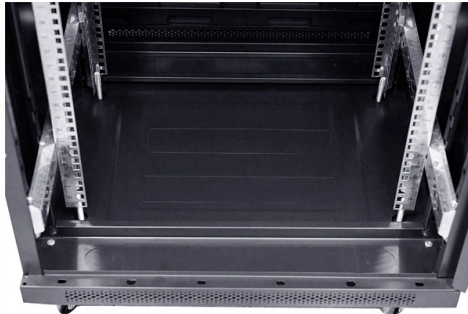


## Laying optical cables in outdoor ducts



### Overview

Do not install a fiber optic cable in a conduit or duct that already contains cabling, regardless of the cable type.

### Key Takeaways

Outdoor optical fiber cables in ducts require careful route preparation, duct cleaning, controlled pulling tension, proper bend radius, and post-installation testing to ensure long-term network reliability. Route and Duct Preparation

Before installation, conduct a route survey to confirm the path, environmental conditions, and key points such as manholes or junctions. Ducts must be cleaned and drained to remove debris, water, or obstructions that could damage the cable during pulling. In some cases, ducts may require conditioning or testing to ensure accessibility and smooth cable passage .

#### Cable Handling and Pulling

Fiber optic cables are sensitive to excessive pulling, bending, and crushing forces. Always follow the manufacturer's specifications for maximum pulling tension and minimum bend radius. For example, stranded loose tube and ribbon cables typically have a maximum pulling tension of 600 lbf (2,700 N), and the minimum bend radius during installation is often 15 times the cable diameter . Use rollers, pull wheels, and cable lubricants to reduce friction and prevent stress on the fibers .



### Installation Techniques

- **Single Pull Lengths:** Outdoor duct pulls are generally limited to  $\leq 1000$  meters per pull to avoid exceeding tension limits .
- **Bends and Offsets:** Gradual bends are preferred; sharp offsets can significantly increase pulling tension. Begin pulling from the end nearest difficult sections to minimize stress .
- **Innerducts:** Subdividing ducts with innerducts can reduce fill ratios and pulling tension, facilitating future cable additions .
- **Blowing or Air-Assisted Installation:** For microcables, high-speed airflow can reduce mechanical stress, allowing longer pulls without a shuttle or rope .

### Safety and Environmental Considerations

Ensure manholes are free of toxic gases and properly cleaned. Barricade areas where cables are unreeled to prevent pedestrian or vehicular interference. Follow all local regulations and safety protocols, including handling of hazardous materials if present .

### Post-Installation Procedures

After laying the cable, perform visual inspections, splice and termination checks, and testing using OTDR or optical power meters. Ensure closure sealing and fiber management meet standards, with coil diameters inside closures  $\geq 40$  mm to prevent microbending . Proper documentation of cable loops, splices, and route markers is essential for future maintenance .

### Key Best Practices

- Always adhere to cable datasheets for tension, bend radius, and environmental limits .
- Use lubricants and rollers to minimize friction and mechanical stress .
- Plan for future expansion with innerducts and proper fill ratios .
- Conduct thorough testing after installation to ensure network performance . By following these procedures, outdoor duct installation of optical fiber cables can achieve long-term reliability, minimal signal loss, and reduced risk of cable damage.

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