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Applications
Engineering Note

# Maximum Vertical Rise for Fiber Optic Cables

## AEN 137, Revision 1

This Applications Engineering Note (AE Note) addresses the maximum vertical distance in which fiber optic cables can be installed. It divides relevant information into the following categories:

- Calculating the maximum vertical rise of a fiber optic cable
- Supporting the vertically installed fiber optic cable

### Calculating Maximum Vertical Rise

Gravity is the predominant force acting on a vertically installed cable such as installation alongside a tower. When calculating the maximum vertical rise of a fiber optic cable, the installer must know the **maximum long-term tensile load** of the cable since this is the tensile load the cable can withstand over time. In addition, the installer must know the cable's weight which is expressed in units of weight/unit length. This information is typically found on the cable's specification sheet or questions can be directed to Corning Optical Communications' (COC) Technical Support Line by calling 800-743-2671.

The maximum vertical rise for a given fiber optic cable is the length of cable whereby the force due to the cable's weight is equal to half of the maximum long-term tensile load of the cable. The formula below mathematically expresses this relationship:

Maximum vertical rise = (½ x maximum long-term tensile load) / cable weight

For a practical example, suppose an ALTOS® All-Dielectric Gel-Free Cable with 72 fibers will be installed vertically alongside a tower. According to the specification sheet, the maximum long term tensile load is 200 lb and the cable weight is 0.049 lb/ft. Note that the correct system of measurement is used for both sets of units (i.e. imperial vs. metric in this example). Using the equation above,

Maximum vertical rise = ½ * 200 lb / 0.049 lb/ft

= 2041 ft

This means the cable can be installed a maximum vertical distance of 2041 ft between vertical load supports.

### Supporting Vertically Installed Cable

Supporting a vertically installed cable depends on the type of cable and application/scenario. A cable vertically installed in lengths greater than the maximum vertical rise must be supported by a split wire mesh grip, or similar device, at intervals not exceeding the maximum vertical rise. Corning Optical Communications' recommends that grips be installed at intervals less than the



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maximum vertical rise to provide additional security and to prevent excessive cable movement. Three common installation scenarios are described below:

**Scenario 1: Cable without Interlocking Armor Outside of a Conduit**

When installing long vertical runs of cable, COC recommends using a split wire mesh grip at the top of the run to support the weight of the cable. The installer must exercise care to avoid exceeding the minimum bend radius of the cable; especially at support points. Intermediate supports or tie-downs should be employed along the cable run at intervals of 20 feet (6 meters) when practical to keep the cable in the desired location. The installer should reference SRP-005-014, "Fiber Optic Cable Placing Intrabuilding" for Intrabuilding installations. In section 7.26, the procedure describes how to secure the cable using a split grip along with intermediate tie wraps. The same procedure would be used in outdoor applications. Additionally, for 2-12F FREEDM® LST™ (gel-free or gel-filled) cable designs, COC recommends adding several cable loops between multiple floors to provide additional coupling in the single buffer tube design. COC recommends using a fixed object with a large enough diameter to support the loops. As an example, one could use a short section of pipe/pvc and wrap the cable around the pipe/pvc to maintain the loop shape while not violating the minimum bend radius.

**Scenario 2: Cable with Interlocking Armor Outside of a Conduit**

Since split mesh grips will not properly support a cable with interlocking armor, COC recommends coiling the cable every 20 meters (65 feet) to provide coupling between the inner cable and interlocking armor components in a vertical installation. COC recommends using a fixed object with a large enough diameter to support the coils. As an example, one could use a short section of pipe/pvc and wrap the cable around the pipe/pvc to maintain the coil's shape while not violating the minimum bend radius. The installer must not exceed the minimum bend radius of the cable when coiling the cable. Corning Optical Communications' recommends securing the cable every 20 feet (6 meters) to keep the cable in its desired location. Failure to couple the cable to the conduit can place an excessive lateral force on the cable at the point where it transitions from horizontal to vertical which can result in higher attenuation over time even though the maximum vertical rise of the cable has not been exceeded.

**Scenario 3: Cable without Interlocking Armor in a Conduit**

Wire mesh grips are not possible in vertical applications employing conduit. Therefore, COC recommends running the cable horizontally for at least 0.6 meters (two feet) every 20 feet (6 meters) to 30 feet (9 meters) of vertical rise to provide coupling between the cable and the conduit. Alternatively, the conduit can be looped every 65 feet (20 meters) to provide coupling. COC recommends using a fixed object with a large enough diameter to support the loops. As an example, one could use a short section of pipe/pvc and wrap the cable around the pipe/pvc to maintain the loop shape while not violating the minimum bend radius. When transitioning from a vertical rise to a horizontal run or looping the cable/conduit, the installer must not exceed the minimum bend radius of the cable. Corning Optical Communications' recommends securing the conduit every 20 feet (6 meters) to keep the cable/conduit in its desired location.

By following the guidelines above, the installer can safely place fiber optic cables in vertical applications. Since the maximum vertical distance depends on the maximum long-term tensile load and cable weight, different cables will have different maximum vertical rise limitations.



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