Prysmian Group

PRYSMIAN Draka

# General Optical Fiber Cable Installation Considerations

**Some key considerations for installing optical fiber cable are highlighted below. Failure to follow these guidelines may result in damage or attenuation increases of the optical fiber or cable.**

**NOTE: The below considerations are not intended to encompass all installation practices. Proper industry installation practices for optical fiber cable must be followed.**

## 1.0 General Considerations

[+] **Bend Radius:** Do not exceed the minimum cable bend radius. For loose tube and ribbon cable, the bend radius is specified at 20 times the cable diameter during tension/installation conditions and 10 times during static conditions (check the data sheet). Pulling the cable at a lower bend radius increases the compression forces on the cable core which can result in tube deformation and possible fiber damage or attenuation increases. Check the data sheet for the specific bend radius.

[+] **Duct Applications:** Special care should be given to the entrance/exit of man holes, hand holes, or pedestals

[+] When racking the cable in manholes or handholes, care should be taken not to pinch the cable against any edges (duct, walls, etc) or corners.

[+] **Pulling Tension:** Do not exceed the maximum specified tensile force for the cable. This is typically 600 lbf for OSP loose tube or ribbon cable. Check the cable data sheet for the specification.

[+] **Cable Breakaway:** A cable breakaway rated at or below the maximum specified cable load shall be used to assure the cable does not exceed its maximum rated pulling tension.

[+] **Swivels:** When cables are pulled, swivels must be used on the cable end to prevent accumulation of cable twist.

[+] **Cable Pulling Grip Installation:** The grip may be applied directly over the jacket; however, be aware that the jacket may pull off the cable before reaching the maximum specified load. Optimum grip strength is achieved by removing part of the jacket to allow gripping of the jacket and cable core. See Prysmian's grip Installation practice for specifics.

[+] ***Cable Crush:*** Care should be taken not to crush the cable. Loose tube and ribbon cable should not be exposed to a short term load > 125 lf /linear inch.

**Any different specified values will be noted on the cable data sheet.**

[+] **Cable Figure 8:** Cable may be placed in a Figure 8 pattern if it needs to be removed from the reel. This pattern minimizes the accumulation of cable twist. Care should be taken to prevent cable damage while the cable is in this configuration. Prysmian does not recommend the use of mechanical figure 8 machines. Many of these machines do not control the cable bend radius and may damage the cable. This is especially important with cable designs using radial strength elements (RSMs) such as ribbon cable.

[+] **Cable Installation Temperature:** The cable should not be installed in environments exceeding its specified maximum and minimum installation temperature. For loose tube and ribbon cable this is typically specified for an installation temperature of -30°C to +75°C.

**NOTE: That indoor/outdoor cables have higher minimum temperature ratings due to the flexibility limitations of the jacket material. Check the cable data sheet for the specific installation and operating temperature rating.**

[+] **Inside Building Applications:** Outside plant cable should not be routed more than 50' inside a building. Follow the local and national codes for proper cable selection for inside applications. Riser cables are generally required for vertical applications and plenum cables are required where there is a positive air pressure space.

[+] **Vertical Rise:** The cable weight in an unsupported vertical rise shall be less than the specified long term operating load. Your manufacturer's specification sheet should be consulted for specifics. Intermediate cable attachment points however are recommended for optimum performance.

[+] **Bonding and Grounding:** Follow your company and local/national bonding and ground procedures when using fiber cable with metallic components.

## 2.0 Aerial Applications

[+] **Cable Pull Off Method:** When pulling the cable off the reel onto messenger mounted cable blocks, special care should be given to size and location of the 1st and last pulley. The reel should be placed as far as practical from the 1st pulley to minimize the angle of the 1st bend. A cable shoot/ pulley ≥ the specified bend radius is recommended to minimize the cable bend at the first and last pulley locations or at any location with a change in direction.

[+] **Cable Drive Off/Moving Reel Method:** The reel should be kept as far as practical from the cable lasher to minimize the cable angle entrance into the lashing machine.

[+] **Drop Cable & Gel Free Central Tube Ribbon Cable:** Coupling coils may be required for aerial applications. Enough cable should be left to accommodate coupling coils on both sides of the splice points. See Prysmian's cable handling / installation guidelines for details.

## 3.0 Duct Applications

[+] **Cable Lubricant** should be used to reduce the cable friction force when pulling cable into duct.

[+] Prysmian multipurpose cable such as loose tube or ribbon can be installed by pulling or jetting in duct applications. The cable jetting recommendations below should be followed.

[+] **Duct Preparation:** Prepare the duct for blowing. This includes assuring the duct inside diameter has sufficient cable clearance for proper blowing. The duct entrance/exit into hand holes or manholes must meet the cable bend radius specification.

## 4.0 Cable Blowing or Jetting in Duct Applications

[+] **Manufacturer Recommendations:** Follow the recommendations of both the blowing equipment and cable supplier.

[+] **Crash Test:** A crash test should be performed to determine the maximum push force. Excessive pushing will cause the cable to cork screw in the duct or fold over which will damage the fiber.

[+] Cable with smaller diameters, will require a lower maximum push force.

[+] The maximum cable push force will also decrease as the duct inside diameter increases.

[+] Sherman & Reilly Super Jet: Per Sherman & Reilly, DO NOT exceed an 800 psi hydraulic force for Loose Tube cables with a diameter < 0.6" and 500 psi for cables < 0.5". The Cable Jet should be used for cable diameters below 0.39". Cable guides must be used for cables ≤ 1.0" in diameter.

[+] **Use The Proper Cable Seals/Guides** based on the cable diameter.

[+] Cable end cap or sealing is recommended to keep the air pressure out of the cable.

[+] Do not over tighten the top of the blowing unit.

[+] **Blowing Distance:** Consider the route to determine the maximum blowing distance. Follow the blowing equipment suppliers blowing distance recommendations; 3000 to 6000 feet is a typical blowing length. A set up with multiple blowing machines may be required.

[+] **Maintain Proper Air Flow** to "blow" the cable verses "pushing" the cable.

[+] Sherman & Reilly recommends using an air compressor with a minimum of 375 cfm. The minimum air pressure in the duct should be 100 psi with 125 psi recommended.

[+] **Air Cooler:** Air compressor cooler should be used as recommended by the blower equipment manufacturer. Typically this is when the ambient air temperature exceeds 80˚F.

[+] Do not attempt to overdrive the blowing machine. Higher speeds will not provide much of a time savings.

[+] The cable should be clean as it enters the blowing equipment to allow for proper gripping of the cable.

[+] Use only cable/duct lubricants recommended by its blowing equipment manufacturer for optical fiber cable.

## 5.0 Splicing/Termination

[+] **Cable Entry:** Follow the cable suppliers recommendations for cable entry.

[+] **Loose Tube Cable Slack Loops:** When there are no accommodations for cable slack storage, the contractor installing cable must be notified to not leave cable slack loops that exceed the maximum recommended mid-span buffer tube storage length specified by the pedestal/closure and cable suppliers. Exceeding this recommendation without cable storage capability at closures or pedestal locations complicates compliance to the maximum length requirements for express buffer tube storage.

[+] **Gel Free Central Tube Cable** (e.g. Ribbon): Cable coupling loops may be required on both sides of the closure with aerial applications. Check with Prysmian for cables specific recommendations.

[+] **Cable Termination:** Cables must be properly terminated to address safety, reliability and performance concerns. As temperature changes contract and expand the cable and its components, the central strength member will attempt to piston and the cable jacket will experience shrinkage forces. A properly terminated cable will prevent any movement of these components. Failure to properly terminate the cable can cause attenuation increases in the cable.

[+] The CSM or RSMs shall be properly secured. This includes a positive stop to prevent the CSM from positioning forward. The end of the CSM shall be placed up against the positive stop of the retention clamp. The CSM retention clamp shall be located in close proximity of the cable end to prevent bowing and possible breaking of the CSM. The CSM shall also be secured as straight as possible to prevent bowing and breaking. Care shall be taken to prevent crushing or damaging the buffer tubes or fiber when attaching the CSM, bonding clamp, or jacket retention clamp.

[+] The cable jacket shall be secured to prevent retraction.

[+] **Cable Bend Radius:** When routing the cable into the closure or pedestal, do not exceed the minimum cable bend radius. Care should also be taken not to crush or kink the cable. DO NOT pull the cable across any edges or sharp corners.

[+] **Cable Routing:** DO NOT store cable within the closure or pedestal unless there is enough room to accommodate the minimum specified cable bend radius.

[+] **Maximum Express Tube Storage:** Buffer tube storage of express routed tubes shall not exceed the maximum lengths specified for the cable design. Contact Prysmian for the maximum storage limit. Exceeding this limit can result in excessive attenuation increases at colder temperatures.

[+] **Tube Bend Radius:** Buffer tube storage and routing shall not exceed the bend radius of the buffer tube to prevent tube kinking, damage of the fibers, or excessive bending induced attenuation. The minimum buffer tube bending diameter is 60 mm for 2.5 mm PP tubes, 100 mm for PBT tubes < = 3.0 mm, and 40 mm for 2.0 mm PP tubes.

[+] **Grounding:** Cable with metallic components shall follow the bonding and grounding requirements of the customer and local or national codes.

[+] **Drop Cable Termination:** Proper cable termination practices should be applied to both distribution and drop cable.

[+] **Coupling Coil:** Central tube drop cable (Figure 8 and Flat Drop) used in self support aerial applications and some dry central tube cable designs used in aerial applications must have coupling loops installed at all termination points to prevent fiber retraction.

[+] **Midspan Access of Fibers In Buffer Tubes:** To minimize fiber damage, it is recommends to use the Prysmian's Midspan Access Tool to open the buffer tube. Care should be taken to use the correct insert size.

[+] **Buffer Tube Removal:** When removing the buffer tube in end access applications, care should be taken to score/ring cut the tube and then flex it at this point to separate the tube. This prevents accidental cutting of the fibers.

[+] **Fiber Bend Radius:** The minimum bend diameter should not be exceeded to prevent bending induced attenuation.

[+] **Fiber Routing:** Bare fiber should be routed in splice trays to protect it from damage.

## Reel Handling

[+] **Rolling Direction:** Always roll the reel in the direction of the arrow on the reel flange.

[+] Never lay the reel on its side.

[+] **Solar Wrap** should be kept on the reel when storing outside.

[+] **Cap Boards:** Remove the cap boards over the inside cable end prior to installation.

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The practices contained herein are designed as a guide. Since there are numerous practices which may be utilized, Prysmian has tested and determined that the practices described herein are effective and efficient. The recommended practices are based on average conditions.

In addition, the materials and hardware referenced herein appear as examples, but in no way reflect the only tools and materials available to perform these evaluations.

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