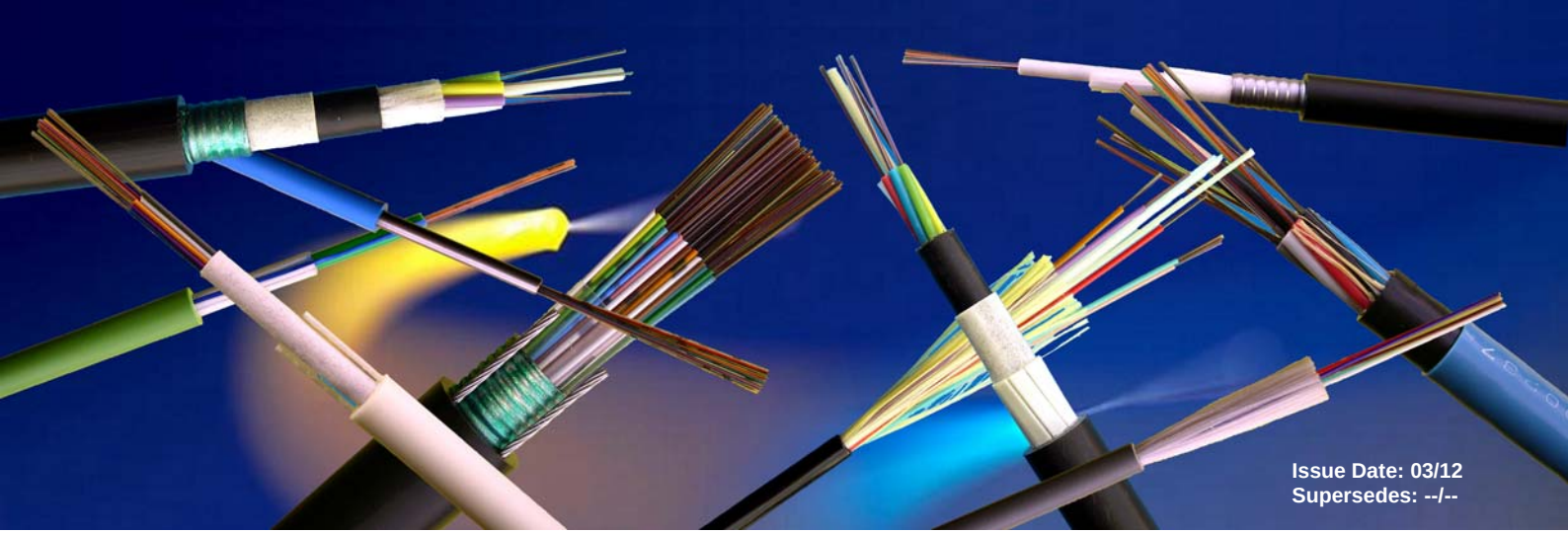

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Optical Fiber Cable

General Installation Considerations

Guideline

VALUE INNOVATION

Draka

Introduction

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 entended to encompass all installation practices. Proper industry installation practices for optical fiber cable must be followed.

General Considerations

Bend Radius: Do not exceed the minimum cable bend radius. For loose tube cables, 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, typically 270daN for standard duct cables but it may vary a lot depending on the cable design. Check the cable data sheet for the specification.

Cable Breakaways: 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 Draka's Grip Installation practice for specifics.

Cable Crush: Care should be taken not to crush the cable. Standard loose tube cable should not be exposed to a short term load typically > 2000N/100mm, but it may vary a lot depending on the cable design. Any different specified values will be noted on the cable data sheet. Please check.

Cable Figure Eighting: 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. Draka 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 Flextube™ cable.

Cable Installation Temperature: The cable should not be installed in environments exceeding its specified maximum and minimum installation temperature as specified in the cable data sheet. Please check.
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 temp.

Inside Building Applications: Outside plant cable should not be routed more than 15m 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 loops and 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.

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 ≥ to 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: Coupling coils are required for aerial applications. Enough cable should be left to accommodate coupling coils on both sides of the splice points.

Duct Applications

Cable lubricant should be used to reduce the cable friction force when pulling cable into duct.
Draka multipurpose cable such as loose tube or Flextube™ can be installed by pulling or jetting in duct applications. The cable jetting recommendations below should be followed.

Cable Blowing or Jetting in Duct Applications

Manufacture 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.

The blowing equipment must be perfectly adapted to the cable diameter and cable performances. The installer must be well trained on the blowing and/or floating techniques.

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.

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. Arnco uses springs to control the maximum compression force, if these are fully compressed, excessive compression will be applied to the cable.

Blowing Distance: Consider the route to determine the maximum blowing distance. Follow the blowing equipment suppliers blowing distance recommendations. A set up with multiple blowing machines may be required.

Maintain proper air flow to “blow” the cable verses “pushing” the cable.

Air cooler: Air compressor cooler should be used as recommended by the blower equipment manufacturer. Typically this is when the ambient air temperature exceeds 25˚C.

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.

Splicing/Termination

Cable Entry: Follow the cable supplier's recommendation 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 midspan 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 (see beow the chapter "Maximum Express Tube Storage".

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 pistoning 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.
- The cable jacket shall be secured to prevent retraction.
- Care shall be taken to prevent crushing or damaging the buffer tubes or fiber when attaching the CSM, bonding clamp, or jacket retention clamp.

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 Draka for the maximum storage limit. Exceeding this limit can result in excessive attenuation increases at colder temperatures. Tubes from the Ribbon In Stranded Loose Tube designs should not be express routed. Indoor/Outdoor loose tube and microduct cables are not specified for midspan express tube storage.
Midspan access can be used with any Flextube™ cable design.

Loose 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. Typical bending diameter for standard buffer tube designs with diameter ≤ 3.0mm is 60mm.

Flextube™ Bend Radius: when Flextube cable design is used the modules can bend very easily without kinking effect. Therefore the minimum bending diameter to be respected is the bending diameter of the fibre itself (for instance 15mm with BendBright-XS G657 A2 fibre).

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 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, Draka recommends using the Draka Midspan Access Tool to open the buffer tube. Care should be taken to use the correct insert size. With Flextube™ design no tool is required. The modules can be easily opened as explained in the Flextube access procedure.

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.

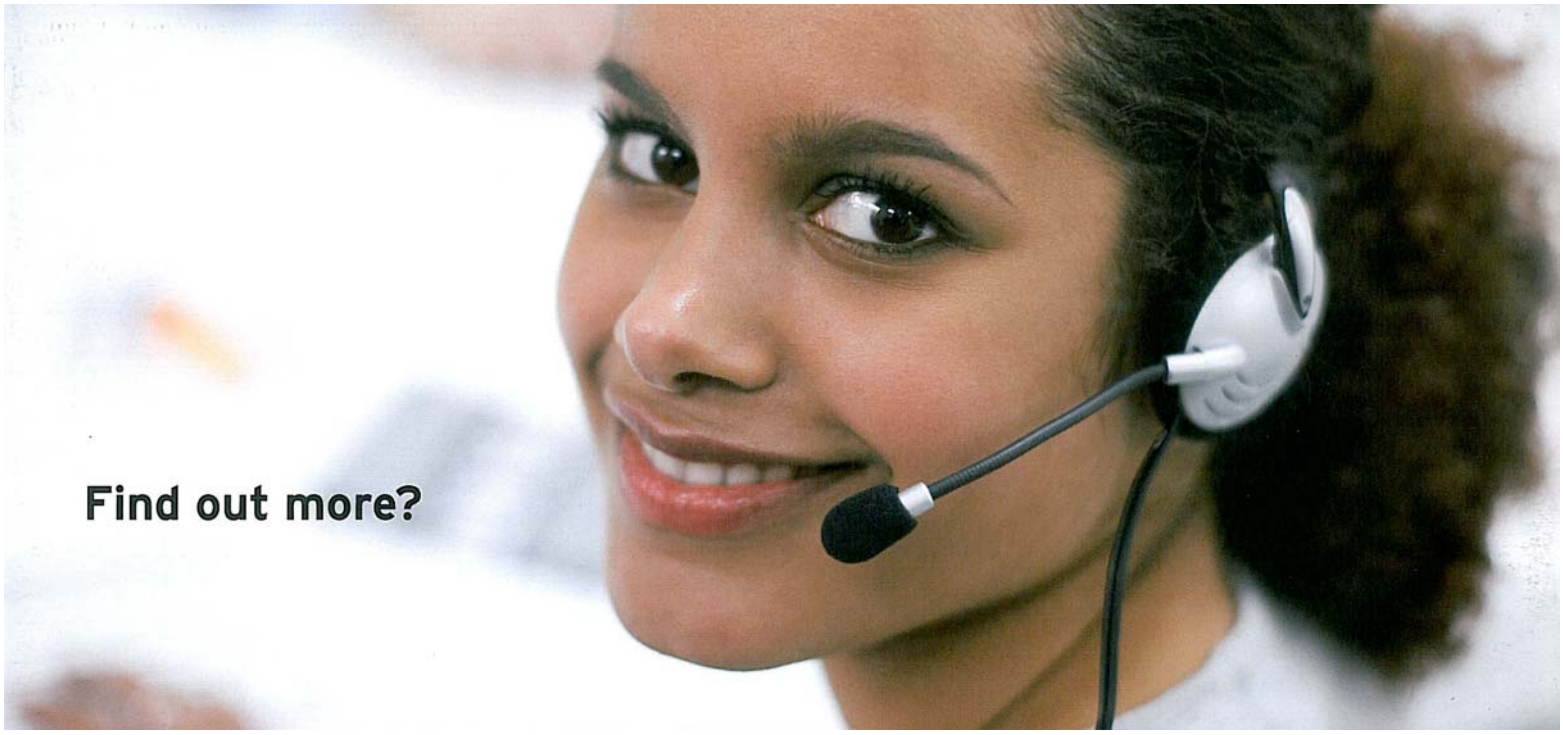
Fiber Routing: Bare fiber should be routed in splice trays to protect it from damage.

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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