

Outside Plant Optical Fiber Cable Termination Guidelines for Stranded Loose Tube Cable

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When terminating Corning Optical Communications stranded loose tube cables there are certain requirements that should be accomplished to ensure that the performance of the cable is not compromised. These requirements are:

1. Sheath Retention - The cable sheath should be secured so that it will not pull out of a closure when subjected to a pull out force of 445 N (100 lbf). The sheath retention requirement is to ensure the closure clamping hardware can isolate fibers and fiber optic splices from tensile stresses applied to the cable during installation. Additionally, correct sheath retention will prevent sheath pullout caused by contraction of the cable sheath at low temperature.
2. Central Member Clamping - The anti-buckling element, or central member, typically a GRP (glass reinforced plastic), should be secured to prevent contact with fibers, buffer tubes or splices within the closure. The GRP should have a physical barrier (forward stop) to prevent any forward movement, often referred to as pistonning. The clamping hardware must withstand a pistonning force of 100lbf. In addition, it is recommended that any tensile strength members, when present, be properly secured.
3. Buffer Tube Routing - Even with the sheath and the central member secured so that they cannot move the buffer tubes can still move up to 10 mm (0.4 inches) in either direction. Care must be taken within the closure to ensure that there is adequate room or space to accommodate this buffer tube movement by employing proper routing techniques. This is accomplished by looping the buffer tubes within the closure before entering the splice tray. The buffer tubes are then secured in the splice tray.
4. Bonding of the Metallic Components - The metallic components of the cable (armoring and / or and steel central members) should be electrically bonded to the closure or a suitable grounding conductor. Proper grounding of the armor is achieved by attaching a bonding clamp to the armor and bonding the clamp with a 6-gauge wire to a closure grounding lug. The bare steel central member is properly grounded by clamping it to the metal strain relief bracket, which in turn is grounded to the closure grounding lug. Consult local electrical codes to ensure compliance.

Why is it important to adhere to these guidelines?

The first two parameters, sheath retention and central member clamping, affect the coupling of the cable components at the closure. Optical fiber cables are designed to act as a unit across the operating temperature window. When the cable is cut for termination, the components at the end of the cable are no longer coupled and may act independently. Proper termination couples the sheath to the core and to the central member. This accomplishes an important task: it ensures that the cable end acts the same as the entire length of cable. All of the different cable components behave as one unit when cabled together. The friction between the components and the radial force of the jacket onto the cable keep the buffer tubes, central member and the sheath coupled. Additionally, any expansion or contraction of the cable is mitigated by the most thermally stable structural component in the cable, the central member.

There are, however, other equally effective methods to ensure the sheath, core, and central members are coupled. These methods include the use of an epoxy plug (e.g., Corning Optical Communications cable end kit) or a suitable heat shrinking material. These techniques localize the coupling of the components at the termination entrance point. When using one of these methods, it is important to follow these guidelines:

1. Sheath Security - The cable sheath should still be secured so that it will not pull out of a closure when subjected to a pull out force of 445 N (100 lbf).
2. Coupling Strength - The epoxy plug or heat shrinking material chosen should maintain a minimum pull out strength of 445N (100 lbf).
3. Central Member Security - It is still required to secure the central member (and tensile strength members if present) at the termination point. The length of the central member is not important but securing the central member will provide support to the sheath retention.

If an installed cable was not previously terminated in accordance with the above guidelines, two things must be completed in order to be sure that the cable will meet specified performance levels over the lifetime of the cable.

- ⇒ 10 meters (or approximately 33 feet) of the cable end must be removed. This removes the portion of cable that may have experienced shrinkage and possibly macro-bending of the fibers (this macro-bending may not be detectable until the cable experiences cold temperatures). The shrinkage is a direct result of the cable components not being properly secured together to resist the shrinkage forces.
- ⇒ Once the affected cable section has been removed, the cable must be terminated in accordance with the requirements listed above.

If you have any questions regarding this subject, please contact Corning Optical Communications, Applications Engineering.

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