

## Application Engineering Note

# Interlock Armor and Corrugated Steel Tape Cables – Pulling Grip Installation Procedure

### Scope:

The scope of this procedure is to describe how to properly install a cable pulling grip on an Optical Cable Corporation interlocked armor (ILA) and corrugated steel tape (CST) fiber optic cable.

### Procedure:

Optical Cable Corporation recommends using pulling grips, with or without swivel eyes, for all ILA and CST cables *and* using a breakaway swivel rated for the proper installation tensile load of the cable being installed. **CAUTION: For interlocking armor cables (ILA), the installation tensile load must not exceed 300 lbs.** Furthermore, the minimum bending radius during installation is greater for the interlocking armor cable (ILA) than for the inner cable. The pulling grip should be sized appropriately for the diameter of the cable. Kellems pulling grips are recommended. Listed below are the model numbers for the Kellems pulling grips with and without the swivel eyes and the corresponding cable diameters.

| <u>Kellems Model #</u> | <u>Cable Diameters</u> |
|------------------------|------------------------|
| <i>With Swivel</i>     |                        |
| 033291007              | .10 - .22 inches       |
| 033291008              | .21 - .35 inches       |
| 033291009              | .32 - .48 inches       |
| 033291010              | .42 - .61 inches       |
| 033291011              | .53 - .74 inches       |
| 033291012              | .64 - .87 inches       |
| <i>Without Swivel</i>  |                        |
| 033291193              | .10 - .22 inches       |
| 033291194              | .21 - .35 inches       |
| 033291195              | .32 - .48 inches       |
| 033291196              | .42 - .61 inches       |
| 033291197              | .53 - .74 inches       |
| 033291198              | .64 - .87 inches       |
| 033291199              | .75 - 1.00 inches      |

When preparing an ILA or CST cable for pulling into a duct or tray, care must be taken to properly attach the pulling grip to the cable.

Optical Cable Corporation recommends measuring the length of the grip (See Figures 1 & 2).



Figure 1: Measure Pulling Grip

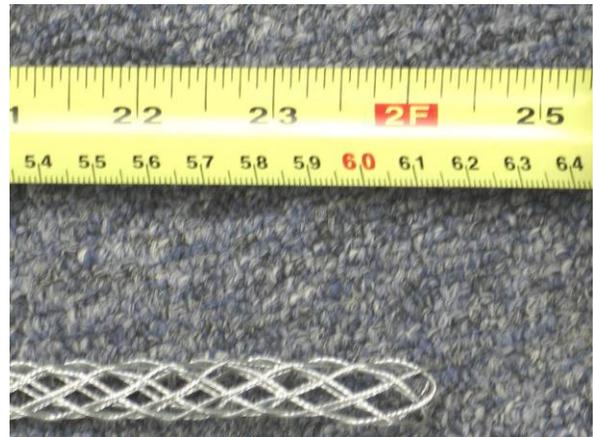


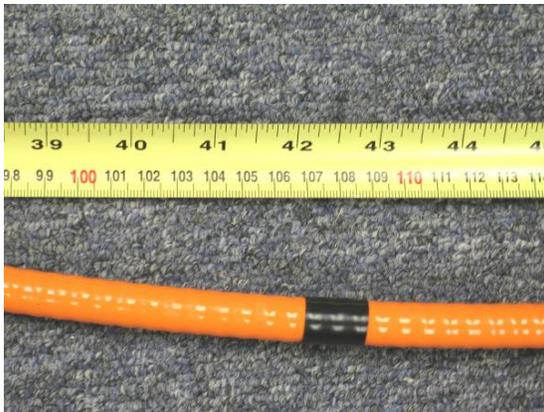
Figure 2: Measure Pulling Grip

Take the length measurement of the grip and multiply that number by either 1.5 or 1.75 in order to get the distance to cut back the ILA or CST (See Figure 3). Mark the cable at this location and remove this section of the ILA or CST. The extra distance takes into account the length of the strength element needed to overlap the armor (see Figure 11).

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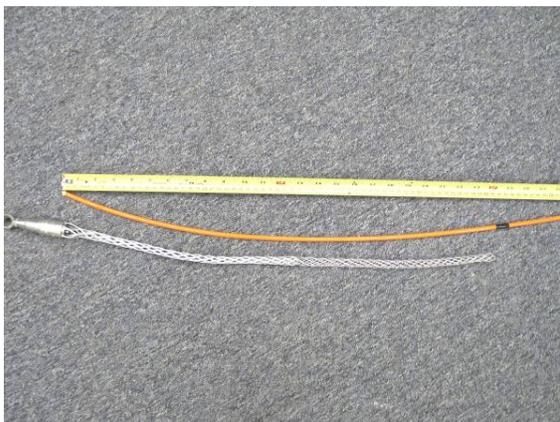
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The larger the multiplier (1.5 to 1.75), the more the grip will overlap the inner cable and not the armor. The tensile strength of the cable is in the strength elements in the inner cable. The goal is to have approximately 75% of the grip attaching to the inner cable with approximately 25% of the grip attaching to the ILA or CST. This procedure allows the inner cable to take most of the tensile load.



**Figure 3:** Measure Armor 1.75 times the length of the grip

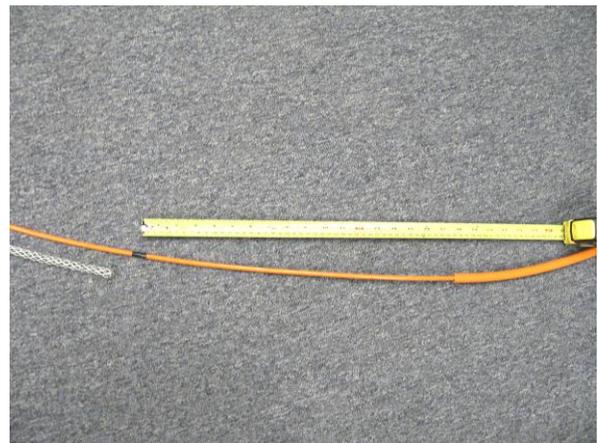
Once the ILA or CST has been removed, lay the grip beside the inner cable and mark the inner cable at the end of the grip (See Figure 4).



**Figure 4:** Mark inner cable at end of grip

From the mark on the inner cable, measure the length of the grip and apply friction tape, 3M 88T Electrical Tape, or a suitable substitute (See Figures 5 & 6). 25% of this length measurement should include the ILA or CST. Make sure that this is correct. The tape should create a smooth diameter change from the inner cable to the interlocked armor.

In some cases, the diameter of the inner cable may be notably smaller than the diameter of the outer cable. The diameter of the inner cable may need to be increased to couple well to the pulling grip. To increase the diameter, apply several wraps of tape to build up the diameter of the inner cable. Choose a tight fitting grip to reduce potential of loose fit over the inner cable.



**Figure 5:** Measure the length of the grip from the mark on the inner cable. 25% of length should include the ILA or CST

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**Figure 6:** Apply tape from mark on inner cable to measured distance of the grip. At least 25% of the distance should cover the ILA or CST

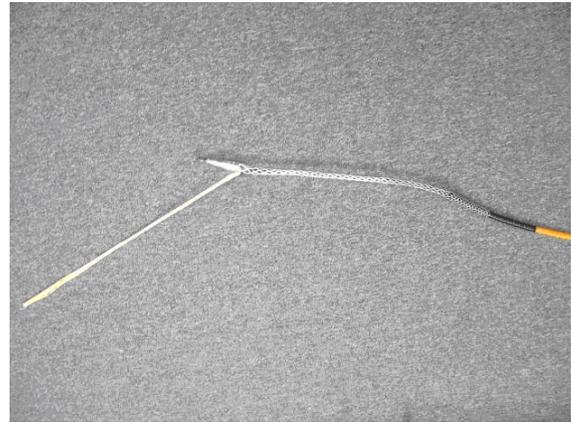
The grip should then be inserted onto the coupled cable assembly that is covered by the tape. The excess length on the inner cable should pass through the end of the grip up to where the tape wrap starts (See Figure 7).



**Figure 7:** Pulling grip is inserted onto the cable assembly

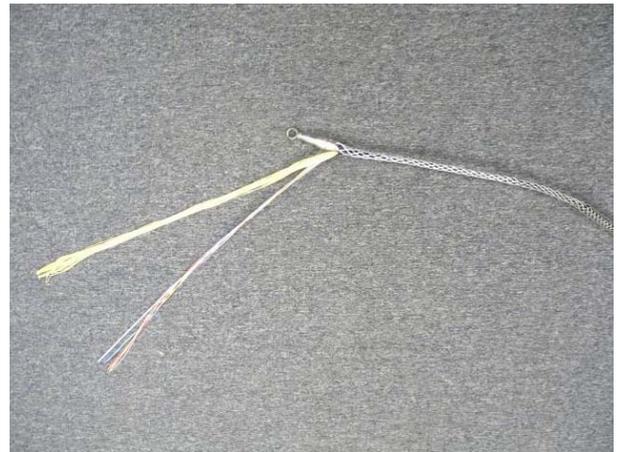
Once the coupled cable assembly has been inserted into the pulling grip, the jacket on the

protruding cable should be removed (See Figure 8).



**Figure 8:** Outer jacket of inner cable is removed, exposing the strength elements and buffers

The strength elements should be separated from the buffers and central strength member (See Figure 9).



**Figure 9:** Strength elements separated from buffers and central strength member

Cut off the excess buffers and central strength member leaving only the strength elements (See Figure 10).

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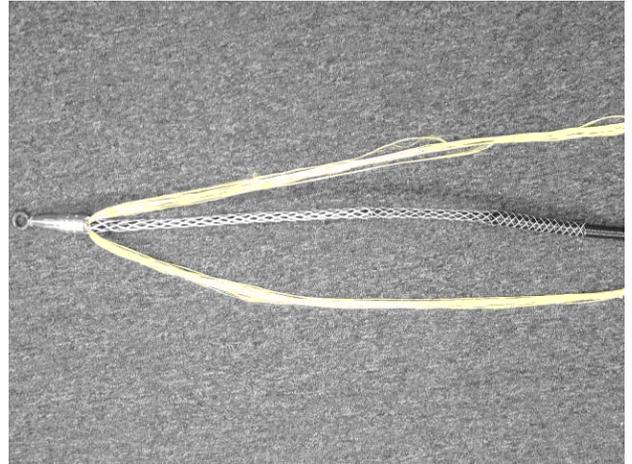


**Figure 10:** Strength elements

The strength element should then be folded back onto the grip *OR* the strength element can be separated into two halves and placed 180 degrees apart (See Figures 11 & 12). If separated in two halves, the strength elements will require running one half of the strength elements back through the pulling grip mesh.

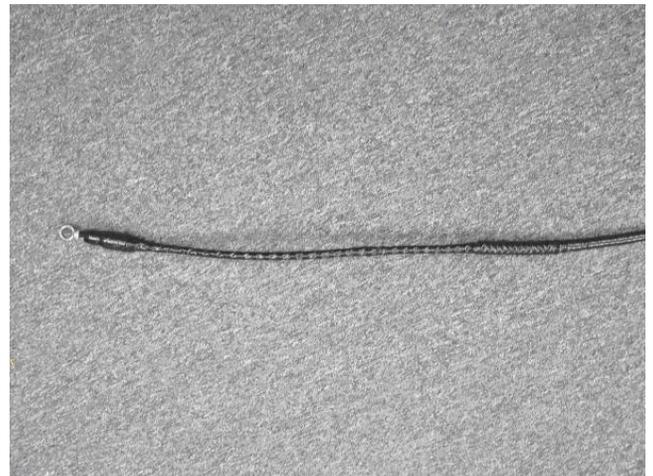


**Figure 11:** Strength elements separated in halves.



**Figure 12:** Strength elements separated in halves separated 180 degrees.

When the strength element has been folded back onto the grip or if the strength elements have been separated 180 degrees apart, 3M 88T Electrical Tape or a suitable substitute is then applied over the strength elements and grip (See Figure 13).



**Figure 13:** Tape applied over strength elements and pulling grip.

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A breakaway swivel should then be installed on the pulling grip before the cable is pulled. Optical Cable Corporation strongly recommends using a breakaway swivel on all pulling grips, whether the pulling grips have or do not have a swivel eye. The breakaway swivel must be rated no more than the maximum installation tensile load of the cable.

**CAUTION: For interlocking armor cables (ILA), the installation tensile load must not exceed 300 lbs.**

Once the cable has been installed, remove the pulling grip and cut off at least 3 feet of the end of the cable where the pulling grip was attached.

#### **ILA with Steel:**

Typical interlocking armor cables are made with aluminum. However, steel can be used as well and still maintain the mechanical, environmental, and UL ratings of a cable that uses aluminum for the armor. The pulling grip procedure listed above is still applicable for either aluminum or steel interlocking armor. However, it should be noted that a steel interlocking armor cable weights more than an aluminum interlocking armor cable. When installing an interlocking armor cable with steel, it is important that the cable tension should be monitored, with or without a breakaway swivel.

*If you have any questions, please contact the Optical Cable Corporation's Engineering Department at (540) 265-0690.*