Leading Optical Innovations

PowerGuide® ADSS CABLE
Installation Guideline Distribution Line Applications

1. SCOPE

1.1 This practice provides a general outline for network design engineers and outside plant construction personnel on the methods of installing an all dielectric circular, self-supporting Fiber Optic Aerial Cable. The methods and instructions are intended as guidelines as each installation will be influenced by local conditions.

1.2 OFS Fitel PowerGuide® Cable meets NESC loading requirements for heavy, medium and light loading conditions. Contact OFS Fitel Engineering Dept. for sag and tension tables. NOTE: when requesting sag and tension tables be sure to specify the ruling span, the sag requirement, and the loading conditions.

1.3 Sag tensions greater than those shown in the sag and tension tables are not to be used unless specifically authorized by OFS Fitel.

1.4 Hardware not listed within this practice or the PowerGuide® Hardware Ordering Guide is not approved for use and is not to be used unless specifically authorized by OFS Fitel.

1.5 It is understood that a site survey should be performed for any installation requiring OFS Fitel PowerGuide® Cable with a complete understanding of this practice to ensure it's proper use.

1.6 Application notes and installation practices which are referenced in this document can be obtained by contacting the Technical Services “hotline” at 800 889 3203 or by visiting OFS Fitel web site at www.ofsoptics.com.

2. GENERAL DESCRIPTION OF CABLE

2.1 This is a self-supporting, circular, all dielectric fiber optic aerial cable.

2.2 Maximum tensions under worst case loading conditions (short term) for PowerGuide® cable designs are determined on a per job basis. A sag and tension sheet will be engineered for each cable design. The short term loading conditions for that particular job can be found on the sag and tension sheet provided from OFS Fitel.

2.3 The maximum allowable tension under normal continuous load (long term) is based on sag and tension requirements. In most cases the cable is sagged to meet existing cable plant which is an acceptable practice as long as the long term tension does not exceed the cable design's long term maximum rating. If specific sag is required, check the sag and tension tables provided with the quote for specific loads for the cable provided. For further information contact OFS Fitel.

2.4 Proper considerations should be taken relative to clearance requirements with other facilities Typically standard conductors and neutrals sag more in the warm summer months than in the winter months. Due to the PowerGuide cables small linear expansion coefficient, temperature variations do not severely affect the vertical sag of the cable. Consult OFS Fitel cable design sag and tension table for accurate long term and short term sag and tension values. Use these values to determine the appropriate structure attachment location to maintain clearances with existing facilities and to clear obstructions.

3. Characteristic Benefits:

a) All Dielectric - no metallic or electrically inductive cable components.
b) Circular Cross Section - minimizes effects of vibration and ice loading compared to figure 8 designs.
c) Self-Supporting - integral messenger eliminates need for lashing.
d) One step installation process.

4. Electrical Stress Mechanisms : Dry Band Arching and Corona

4.1 Dry Band Arcing - Over time the surface of the PowerGuide cable jacket may become conductive due to rain or pollutants.

4.2 In space potentials greater than 12 kV, this could lead to an electrical stress mechanism called dry band arching which can lead to degradation of the jacketing material. To protect against dry band arching two classes of cable jacketing materials have been established per Section 3.7 IEEE P1222.
ClassA: Medium density polyethylene (MDPE)- suitable for applications where the electrical space potential is less than or equal to 12 kV.
ClassB: Tracking Resistant jacket (TR)- Suitable for applications where the electrical space potential is less than or equal to 24 kV.

4.3 It is recommended that the electrical space potential be calculated when installing cables in routes where the conductor voltage exceeds 69kv by completing OFS Fitel AN-203 and returning it to OFS Fitel. OFS Fitel can then provide e-field space potential profiles to determine the most suitable location for cable placement. To obtain a copy of AN-203 please contact our customer service department at 1-800-366-3483

4.4 Corona – Corona occurs on both conductor and ADSS attachment hardware and can be seen with special light enhancing binoculars at night. In laboratory testing corona has occurred at space potentials as low as 16 kV. Unlike Dry Band Arching, corona is not a heat generating process. It discolors and may chemically change the jacketing material, which might limit the expected lifetime of the cable. To control Corona, OFS Fitel recommends the use of Corona coils when using tracking resistant cables. Corona coils effectively increase the onset of corona above 30 kV, which is well above the maximum space potential voltage of 25 kV recommended for TR PowerGuide cables.

5. APPROVED VENDOR HARDWARE LIST Preformed Line Products (PLP), Mosdorfer

5.1 Item - dead end assembly - each assembly comes complete with the dead end grip and the structural reinforcing rods (see Figure 1, Deadend Assembly Parts). The thimble clevis is required for all dead end assemblies and is included with dead end assemblies purchased from PLP, Mosdorfer,. or through OFS Fitel. Consult with Preformed Line Products or Mosdorfer for ordering information. See Figure 1 for dead end assemblies with reinforcing rods and figure 2 for short span dead ends without reinforcing rods.

a) Dead end assemblies are used for line angles > 20° or 30° (which occur as a result of changes in direction or elevation), for cable splice locations, and cable start and end points.
b) Figure 1 identifies the associated hardware to be used with the dead end assemblies. Through bolts, washers and nuts are usually standard pole line hardware items that may be purchased through any local hardware distributor. Figure 1 identifies the use of an extension link with the dead end assemblies. The use of this extension link is recommended to maintain a uniform bend radius at dead end locations (see Figure 8)
c) The use of this extension link is not mandatory as long as the cable minimum bend radius is maintained. For PowerGuide® cables this minimum bend radius is 15 times the cable outer diameter during dynamic conditions (during installation) and 10 times the cable outer diameter during static conditions (installed). For PowerGuide AccuTube™ ribbon cables the recommended bend radius is 15 times the cable outer diameter during dynamic conditions (during installation) and 15 times the cable outer diameter during static conditions (installed)

5.2 Tangent supports such as the Preformed Line Products Fiberlign Dielectric support are for spans up to 600 feet and line angles from 0 to 20 degrees, which occur as a result of changes in direction or elevation. Tangent clamps may be installed as a fixed attachment or as a suspension attachment. Please consult OFS Fitel or Preformed Line Products for additional information on tangent support options.

5.3 Downlead cushion kits provide strain relief for the cable as it exits the dead end assembly to access splice locations or cable guard when making the transition from aerial to underground (see Figure 8). Consult OFS Fitel or Preformed Line Products for ordering information.

5.4 Heliformed Suspension Units are for spans between 600 feet – 2000 feet and line angle changes which occur as a result of changes in direction or elevation up to 30 degrees. These suspension units may be substituted for dead ends for line angles from 20 to 30 degrees, which occur as a result in changes in direction or elevation. Consult OFS Fitel or Preformed Line Products for ordering information. Heliformed suspension units are available with either a single layer or a dual layer of rods depending upon the maximum span length requirements. (see figures 3)

5.5 Items - washers, machine bolts, eye nuts, thimble clevis, and extension links may be ordered through several different pole line hardware suppliers.

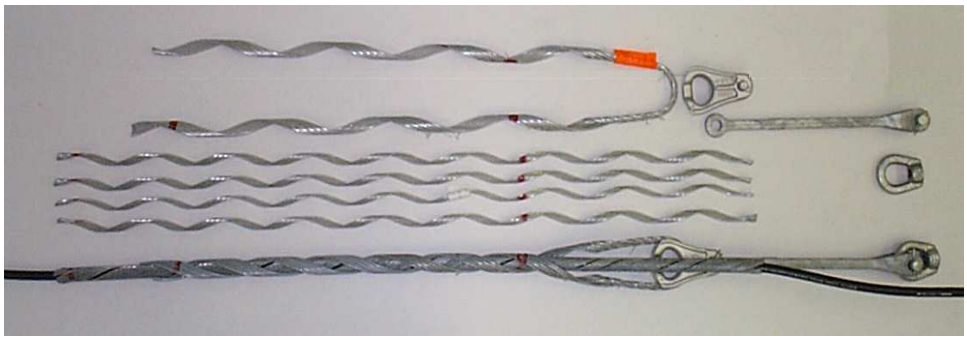


Figure 1 - Dead End Assemblies - used at start & end points, splice locations, and slack storage locations.

Figure 2 – Dead End Assemblies for Short Span Dead Ends Reinforcing Rods

Figure 3 - Heliformed Suspension Units – used as intermediate attachments between dead ends for span lengths up to 2000 feet and line angles due to changes in elevation or direction up to 30

Figure 4 - Intermediate Suspension Attachments – used between dead ends for span lengths up to 600 feet and for line angles up to 20° due to changes in elevation or direction.

EQUIPMENT

6.0 Bucket trucks or equivalent.

6.1 Single wheel type stringing blocks (Sherman Reilly type) are recommended for all applications. Multiple wheel quadrant blocks are not recommended. This type of block is often referred to as a "3 block". Cable Stringing Blocks - the sheave (wheel) diameter of the stringing block is determined by the minimum cable bend diameter. PowerGuide® loose tube cable minimum bend diameter is 30 times the outer diameter during installation and 20 times the cable outer diameter after the installation has been completed. PowerGuide®ribbon cable designs have a minimum bend diameter of 30X the OD during installation and 30X after the installation has been completed. Select stringing blocks for your applications accordingly. Use of permanent attachment hardware as a substitute for stringing blocks is not recommended. Select stringing blocks for your applications according to Tables 1 through 3.

Note: OFS Fitel recommends the use of unlined rollers whenever possible. If lined rollers are to be used, urethane lined rollers are recommended over neoprene lined rollers.

6.2 Mid-span blocks - used to support cable in mid-span over all roadways and obstructions.

6.3 Pulling grip with swivel - used to secure pulling rope to cable for installation. Breakaway swivels are recommended when other forms of load measurement are not being used.

6.4 Pulling rope- used to pull cable through the stringing blocks. The pulling rope to be used must be as long as the installation run, if the cable is to be installed in one continuous section. High quality torque balanced ropes with minimum elongation properties, which provide adequate tensile strength capabilities for cable design to be installed, are recommended.

6.5 Take-up machine - used to pull the rope with the cable attached through the stringing blocks. The take up should have tension and speed controls to ensure proper installation. It may also be used for the sag & tension procedure. The take up equipment to be used should have an accurate means of monitoring the line tension in foot-pounds. This will insure compliance with the recommended maximum installation tensions and corresponding stringing block sizes detailed in Tables 1through 3.

6.6 Pay off machine - used to pay off cable during installation. The pay off should possess an automatic or manual braking device to prevent the cable from running free. Trailers equipped an over spin brake device are generally acceptable for span lengths up to 800 and installation tensions up to 800 pounds. For longer span lengths and higher installation tensions generally associated with transmission line applications bull wheel tensioners are recommended (see photos 1,3, &4)

6.7 Dynamometer - used to monitor cable tension during sagging operation, once the cable has been installed.

6.8 Chain hoist, winching device or equivalent - used to sag cable at the appropriate tension between dead end locations.

7.0 Installation Procedure

7.1 This procedure assumes a stationary reel method of installation where a pulling rope and stringing blocks are installed prior to the installation of the cable (see Figure 4). The procedure also assumes that the cable is being installed on a distribution pole line. Alternate methods such as the moving reel method or the stationary method (see Figures 5 6, & 7) where the cable and stringing blocks are placed from structure to structure before sagging is completed should be considered. Determination of the installation method will depend upon local conditions. Moving reel methods are generally associated with distribution pole lines whereas the stationary reel method (install block, install rope, pull cable) may be used for both distribution and transmission line applications.

7.2 Route Survey

a) A route survey shall be made whether use is made of an existing pole line or whether a new pole line construction is planned. During the survey determine the most effective method of installation.

b) Deviations from straight either horizontal or in elevation shall be noted to enable ordering of required hardware. Depending on the hardware being used, any line angle changes due to changes in direction or elevation over 20° or 30° should be double dead-ended. This will be very important when ordering the required amount of hardware.

c) A route survey shall indicate if route clearing is necessary. This may imply pruning of tree branches, etc.

Note: It should be apparent that small sags imply high tensions and therefore end poles as well as out of line poles may require additional guying

.

d) If the length of the route will require more than one reel of cable;

- Locate the splice or splices in a position that will minimize the number of turns in each section, which will facilitate cable installation.

- Locate the splice at a point which will be easily accessible for maintenance and splicing purposes thereby minimizing the amount of slack cable required.

e) when surveying attachment points for the fiber optic cable, insure that grade changes in the route are considered. The transition in grade changes should be made over several spans whenever possible.

f) Evaluate the need for and quantity of maintenance coils.

g) Evaluate structures relative to the placement of stringing blocks. This should include the calculation of line angles due to changes in elevation or direction.

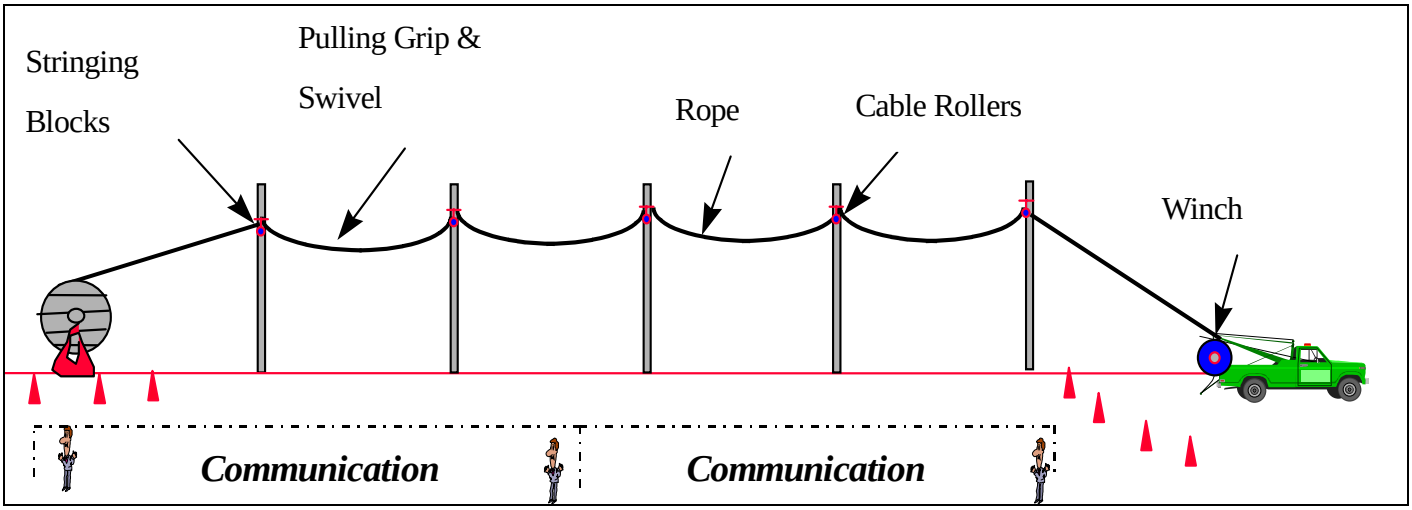


Figure 4 Stationary Reel Method Using a Pre-Installed Rope

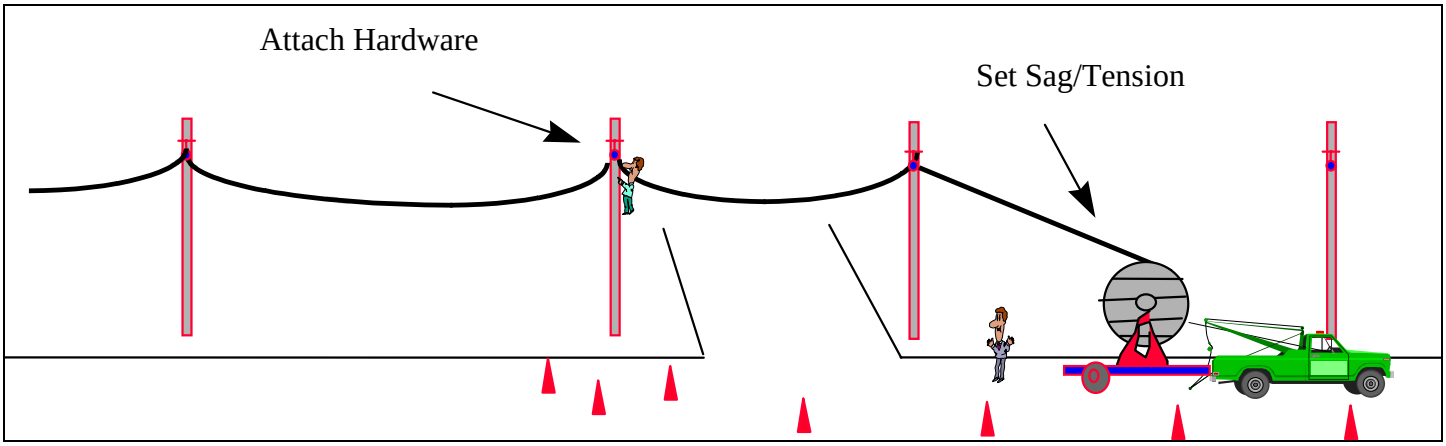


Figure 5 Moving Reel Method

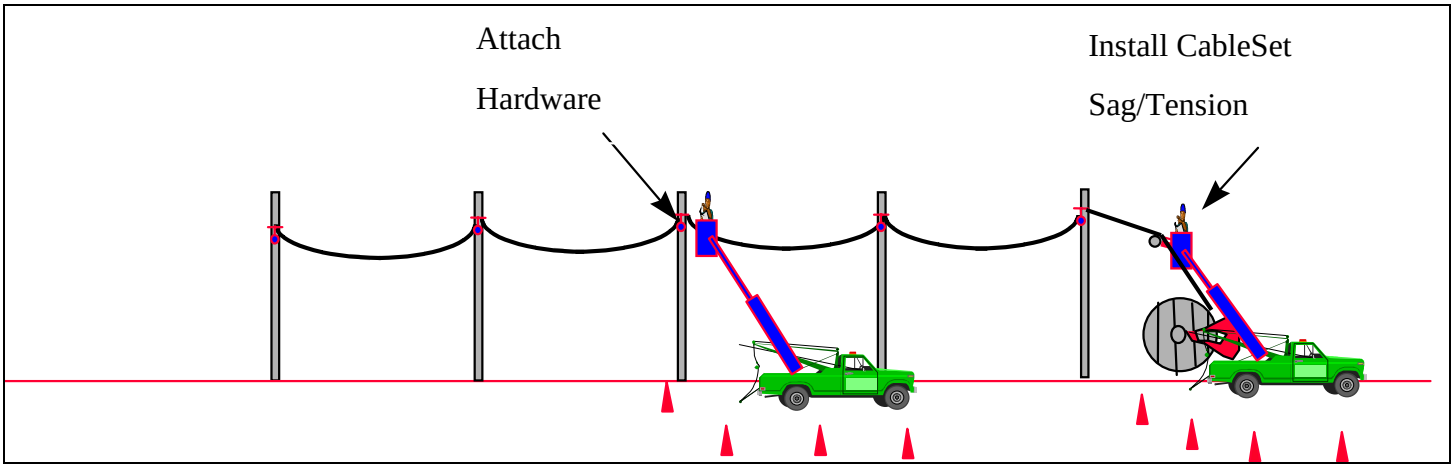


Figure 6 Moving Reel Method

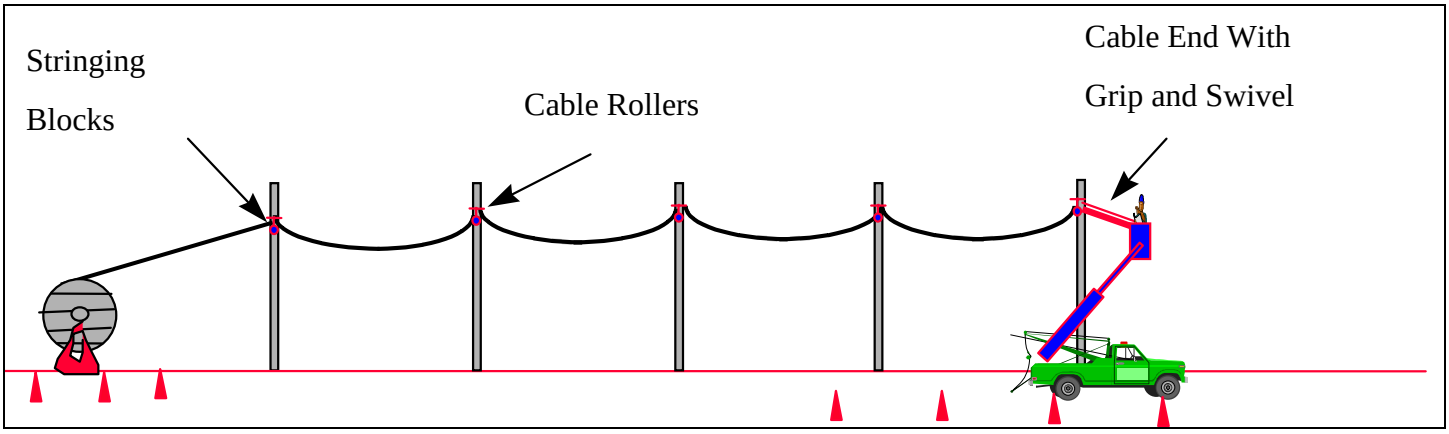


Figure 7 Stationary Reel Method Pulling Cable

7.3 Stringing Blocks, Rope and Pole Framing for Hardware

a) Structure types: wood poles, concrete poles, steel poles, and steel lattice towers are the main types of structures associated with utility distribution and transmission aerial routes.

b) Placing appropriate hardware for the structure type to support the ADSS cable suspension hardware, installation of stringing blocks, and installation of pulling rope can be accomplished in one pass throughout the installation route.

c) Secure the proper sized stringing block on the pole at an attachment height relative to grade changes. Tables 1, 2, & 3 shows the proper stringing block groove diameter relative to the cable O.D., line angle change, and estimated installation and sagging tensions.

Note: The **Minimum Bend Radius** for OFS Fitel standard loose tube and Accutube™ fiber optic cables during the installation process is 15 times the cable outer diameter. For standard loose tube cables under installed conditions the minimum bend radius is 10 times the outer cable diameter and for Accutube ribbon cable designs the minimum bend radius under installed conditions is 15 times cable outer diameter.

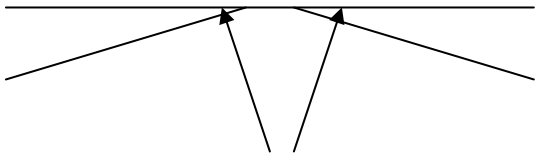
Example: Roller size calculation
Standard Loose Tube Cable O.D. = 1.00”
Bend Radius = 1.00” x 15 = 15” Radius
Pulling Block Diameter = 15” x 2 = 30”

d) When selecting a stringing block, be aware that the outside diameter given by the manufacturer does not reflect the actual O.D. of the stringing block. Most manufacturers measure the diameter from the flanges of the stringing block and not the groove.

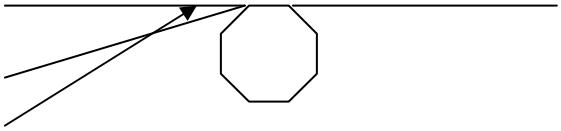
e) The bottom groove diameter of the stringing block should be used when selecting the correct stringing block for the cable size being installed. Table 2 shows the bottom groove diameter for typical stringing blocks relative to the manufactured cable outer diameter and line angle. Check the manufacture’s specifications for the correct groove diameter of the stringing blocks to be used.

f) The use of unlined stringing blocks is recommended. When selecting blocks for specific line angles due to changes in direction and elevation:

The total line angle change at a specific structure is determined by the position of the previous structure in the back span and the position of the next structure in the route. The maximum line angle for either side of the structure must not exceed 10° for tangent hardware for line angles up to 20° and 15° for tangent hardware for line angles up to 30°. Use the same criteria regarding line angle changes for the selection of stringing blocks.



10° Maximum for tangent hardware for line angles up to 20° and 15° maximum for tangent hardware for line angles up to 30°



10° maximum for tangent hardware for line angles up to 20° and 15° maximum for tangent hardware for line angles up to 30°

g) When large diameter stringing blocks are placed (i.e. > 16" in diameter), secure the block in such a way that it remains parallel to the ground during cable placement. This will prevent the block from excessive movement during cable placement, which in turn will prevent the cable from riding up or "jumping" out of the groove of the stringing block. It is the responsibility of the installer to make sure that stringing blocks are placed on the structures in a manner which will facilitate the cable installation without causing mechanical damage to the cable. Inspect the stringing block surfaces to insure that there are no burrs or defects which could cause mechanical damage to the cable sheath during placement.

h) Once the block has been secured, place the pulling rope through the block and continue to the next pole location.

i) Use mid-span supports where necessary to clear all roadways and obstructions.

j) Continue steps b - e throughout the installation route.

7.4 Payoff Set Up

a) Remove all lagging material from the reel Be sure to remove the lagging that protects the tail of the cable. Failure to remove this lagging could result in cable damage.

b) The plastic guides over the tail should not be removed but lifted out of the flange grooves. During the installation process a phenomenon called “cable walkout” occurs. This is when cable tail is forced out of the cable slot during the installation process causing the tail length to increase. The purposes of the plastic guides are to allow the cable to move freely while the cable is being installed. If the tail of the cable is restricted so that cable walkout cannot occur, then the excess cable length is forced into the cable winds which could result in cable damage.

c) Place the reel payoff at a distance from the pole equal to at least 3 times the attachment height of the pole to maintain the minimum bend diameter of the cable at the stringing block location on the pole. Calculate the line angle to the pole based on the position of the reel pay off. Use the appropriate sized stringing block based on recommendations in tables 1, 2, & 3 and in section 7.3 C.

d) Reel payoff should be placed directly in line with the first roller. If the reel payoff is off to one side cable twisting may occur. (see photo 1)

Photo 1

e) Insure that the cable is paying off the top of the reel.

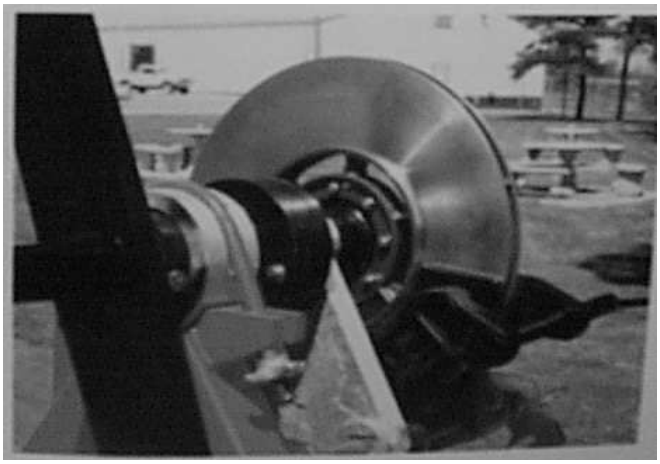
f) Attach the pulling grip and swivel to the PowerGuide® Cable. See OFS Fitel Installation Practice IP-013 for pulling grip attachment procedure.

Photo 2

g) Check the cable reel flanges for any obstructions that may interfere with the cable payoff.

h) The reel payoff should have a breaking mechanism to control the payoff during the installation by applying back tension to the cable. The breaking system will keep the cable from back lashing when sudden stops occur as well as control the cable sag during the installation

Photo 3



Payoff Disc Break/Overspin brake

Note: A bullwheel tensioner (photo 4) should be used when span lengths are over 1000 feet or when installation tensions are expected to reach over 800 lbs. The bullwheel tensioner allows better control of the tension during the installation than that of a standard disc type overspin break.

Photo 4

Bull Wheel Tensioner

i) Brake tension should be set as low as possible while still maintaining cable clearances over roads and other areas were cable clearance may be a concern during the installation.

7.5 Cable Installation

a) Start the take up device and pull the cable at a speed of no more than 40 meters per minute (130 ft. per minute).

b) Ensure that the brake at the payoff reel is engaged to maintain adequate back tension on the cable

c) The construction foreman shall follow the cable installation to monitor the back tension and pulling speed while maintaining constant communication between the payoff and the take up point.

Note: Once the pull is started try to maintain a constant and steady pull until the installation pull is completed.

d) When the cable installation is complete, be sure enough excess cable is available at both ends for cable termination.
e) It is recommended that additional linemen be used to monitor the cable at critical points in the route. These critical points are generally major intersections, hard corners or locations where the cable sag be must monitored due to clearance issues. These additional linemen should also have to capability to communicate with the cable take up and pay off locations.

7.6 Determination of Sag and Tension – two methods of tensioning cable are described in this procedure for final cable installed sag.

a) Before sagging the cable, the appropriate sagging tension should be determined by referring to the OFS Fitel sag and tension table.
b) From the sag and tension table the tensions required to meet sag requirements for each span can be determined. Because sag and tension tables are different for each PowerGuide® cable design, the appropriate sag and tension tables for the PowerGuide® cable being utilized should be obtained from OFS Fitel.

Method 1 – Tensioning Cable Between Dead End Locations

a) Once the installation of the cable has been completed, secure the installed cable end to the structure with the dead end assembly. Follow the manufacturer's recommended assembly procedures. Be sure that sufficient slack has been provided at the finish end to access a splice point or a conduit system

b) The number of line angles exceeding 20 or 30 degrees,(depending upon the hardware selected) in an installation run plus one shall determine the number of times that the cable shall be tensioned.

c) The cable should be sagged starting at the finished end working your way back to the reel from one dead end location to the next dead end location. The cable can be sagged with any number of tangent supports (structures where line angles are < 20° or 30° Depending upon hardware selected) between each dead end. The tangent supports can be installed after the installation of the dead end hardware.

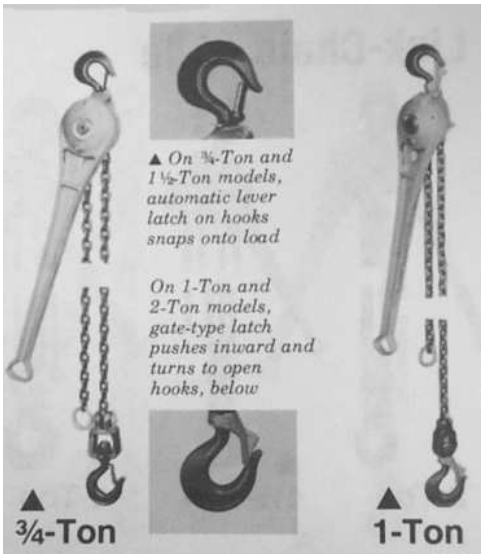
Note: Do not cut the cable at the reel end until sag and tensioning has been completed.

d) At the first dead end location from the finished end attach a temporary dead end for sagging. Make sure the temporary dead end is installed far enough out from the structure to take up all of the slack required for final sag and tension. Depending upon the structure type, the span lengths and the final tension, it may be necessary to secure the cable on the opposite side of the structure to maintain the clearance in the adjacent span or to provide slack for configuration of the cable and hardware on the structure.

Note: A temporary dead end is a dead end that is partially installed for use as a pulling device. This is the only recommended device used for pulling the PowerGuide® cable at mid span during sagging.

e) A tensioning device should be attached to the structure where the first dead end is to be placed.

Note: There are several tensioning devices available from your local distributor. The most common type used is a cable/chain hoist. If a hydraulic tensioner (Puller) is used, care should be taken to insure that the minimum bend diameter of the cable is not compromised by using too small a stringing block at the dead end or intermediate attachment locations. Tensioning method 2 covers general precautions when using a hydraulic tensioner/puller.



f) Once the tensioning device has been secured it should then be attached to the temporary dead end.

Note: If the exact sagging tension is desired or over tensioning is a possibility, a dynamometer should be placed between the chain hoist and the temporary dead end to measure the sagging tension.

g) Use the tensioning device to pull the cable to the desired sag or tension.

h) The location of the permanent dead can know be determined using the extension link and heliformed dead end. Once this location is determined install the permanent dead end at this location and attach it to the structure.

i) Once the permanent dead end has been placed release the tension on the temporary dead end and remove it from the cable. The cable should now be at the preferred sag and tension.

j) Mark the cable on the other side of the structure where the second dead end is to be attached.

Note: When installing a double dead end (two dead end assemblies on one pole) enough cable slack should be provided so that the cable assumes a gentle and uniform curvature between the two dead ends without contacting any obstructions. A double dead end should be placed at each splice location, locations where maintenance slack will be accumulated or when line angles exceeding 20 or 30 degrees due to changes in direction or elevation are encountered.

k) Once the double dead end is completed, move to the next location requiring dead end assemblies and repeat the tensioning procedure per paragraph 7.6 for each location requiring dead end assemblies until the entire installation run is complete.

l) When sagging has been completed secure the cable at each tangent (intermediate pole) location with the appropriate hardware based on changes in direction or elevation.

Method 2 – Tensioning Cable Using a Hydraulic Tensioner Puller

This method utilizes the tensioner/puller to tension the cable for the entire length of cable installed.

a) Once the entire length of cable has been installed, cable slack from the reel must be pulled to the necessary locations. Once the necessary cable slack has been pulled, secure the cable on the structure with the appropriate dead end assembly
b) Consult the OFS Fitel sag and tension table for the appropriate long term tension for the section of cable between dead end locations. Using the tensioner/puller and an in line dynamometer, pull the cable to the desired long term tension per the OFS Fitel sag and tension tables.
c) After the cable tension has been reached, the stringing block must be removed at the first double dead end location before the dead end assembly can be installed. The cable will be under final tension. Do not exceed the minimum bend radius for the cable design when removing the cable from the stringing block. Once the cable has been removed from the stringing block the dead end assembly may be installed per the manufacturer's recommendations.

d) Once the first dead end has been installed , release the tension on the cable with the puller tensioner.
e) It may be necessary to use a temporary dead end to pull enough slack to configure the cable from the first dead on the structure to the second.
f) Once an adequate amount of slack has been pulled, install the second dead per the manufacturer's recommendations.
g) Move to the next double dead location and repeat steps b through f.
h) For a double dead end on a structure where cable slack will be coiled for maintenance or future access, the cable slack must be pulled back before the second dead end is installed. The tension on the cable when the slack cable is pulled back should be minimal. Maintain only enough tension to clear obstructions during this process. Utilize proper equipment during this process to maintain cable minimum bend radius.
i) Once the cable slack has been pulled in, secure the second dead.

Note: long span lengths sometimes require high tensile loads for long term tension. When long term tension of >1500 pounds is required adequate size stringing blocks must be used to prevent excessive side wall pressure and subsequent mechanical damage to the cable. Please consult Table 3 page 11 in this guideline for recommendations.

Table 1 Stringing Block Sizes for Installation Tensions ≤ 600 lbs

Cable Outer Diameter	Block size for Line Angles from 0° to 20°	Block Size for Line Angles from 21° to 45°	Block Size for Line Angles from 46° to 90°
1.25	8	18	36
1.20	8	18	36
1.15	8	18	36
1.10	8	18	36
1.05	8	18	30
1.00	8	18	30
0.95	6	18	30
0.90	6	16	30
0.85	6	14	30
0.80	6	14	30
0.75	6	14	24
0.70	6	12	24
0.65	4	12	24
0.60	4	12	18
0.55	4	8	16
0.50	4	8	16

Table 1 Stringing Block Sizes for Installation Tensions 600 to 1000 lbs			
Cable Outer Diameter	**Block size for Line Angles from 0° to 20°**	**Block Size for Line Angles from 21° to 45°**	**Block Size for Line Angles from 46° to 90°**
1.25	18	30	36
1.20	18	30	36
1.15	18	30	36
1.10	18	30	36
1.05	18	24	30
1.00	18	24	30
0.95	18	24	30
0.90	16	24	30
0.85	14	24	30
0.80	14	24	30
0.75	14	18	24
0.70	12	18	24
0.65	12	18	24
0.60	12	16	18
0.55	8	12	16
0.50	8	12	16

Table 1 Stringing Block Sizes for Installation Tensions 1000 to 1500 lbs			
Cable Outer Diameter	**Block size for Line Angles from 0° to 20°**	**Block Size for Line Angles from 21° to 45°**	**Block Size for Line Angles from 46° to 90°**
1.25	24	30	36
1.20	24	30	36
1.15	24	30	36
1.10	24	30	36
1.05	24	30	30
1.00	24	30	30
0.95	24	30	30
0.90	24	24	30
0.85	20	24	30
0.80	20	22	30
0.75	18	22	24
0.70	18	18	24
0.65	16	18	24
0.60	16	16	18
0.55	12	16	16
0.50	12	16	16

Table 4 – Sherman Reilly Stringing Block Diameter vs. Groove Diameter.	
Typical String Block Sizes	
Outside Block Diameter (inches)	**Bottom of Groove Diameter (inches)**
7	**4.8**
10	**7.5**
12	**9.5**
14	**12**
16	**14**
20	**16**
22	**18**
28	**24**
35	**30.5**
42	**36**

Note: If the sagging tensions are over 600 lbs the cable should not be left in the stringing blocks for an extended amount of time at full tension. If it is not possible to install the tangent supports within a reasonable amount of time (i.e. 24 hours), reduce the tension on the cable below 600 lbs or to a minimum tension to maintain clearances over obstructions until the hardware can be installed.

Note: Tangent supports can be placed as soon as the spans are tensioned between dead ends. If an installation crew has the man power, one crew can install the tangent supports while another crew is sagging the next section between dead ends. This procedure can significantly speed up the installation process.

j) Repeat steps for method 2 until all the dead ends where line angles exceed 20° or 30° (depending upon tangent hardware selected) have been installed.
k) Once the cable has been secured at all the dead end locations, secure the cable at intermediate poles using the appropriate hardware and assembly instructions.

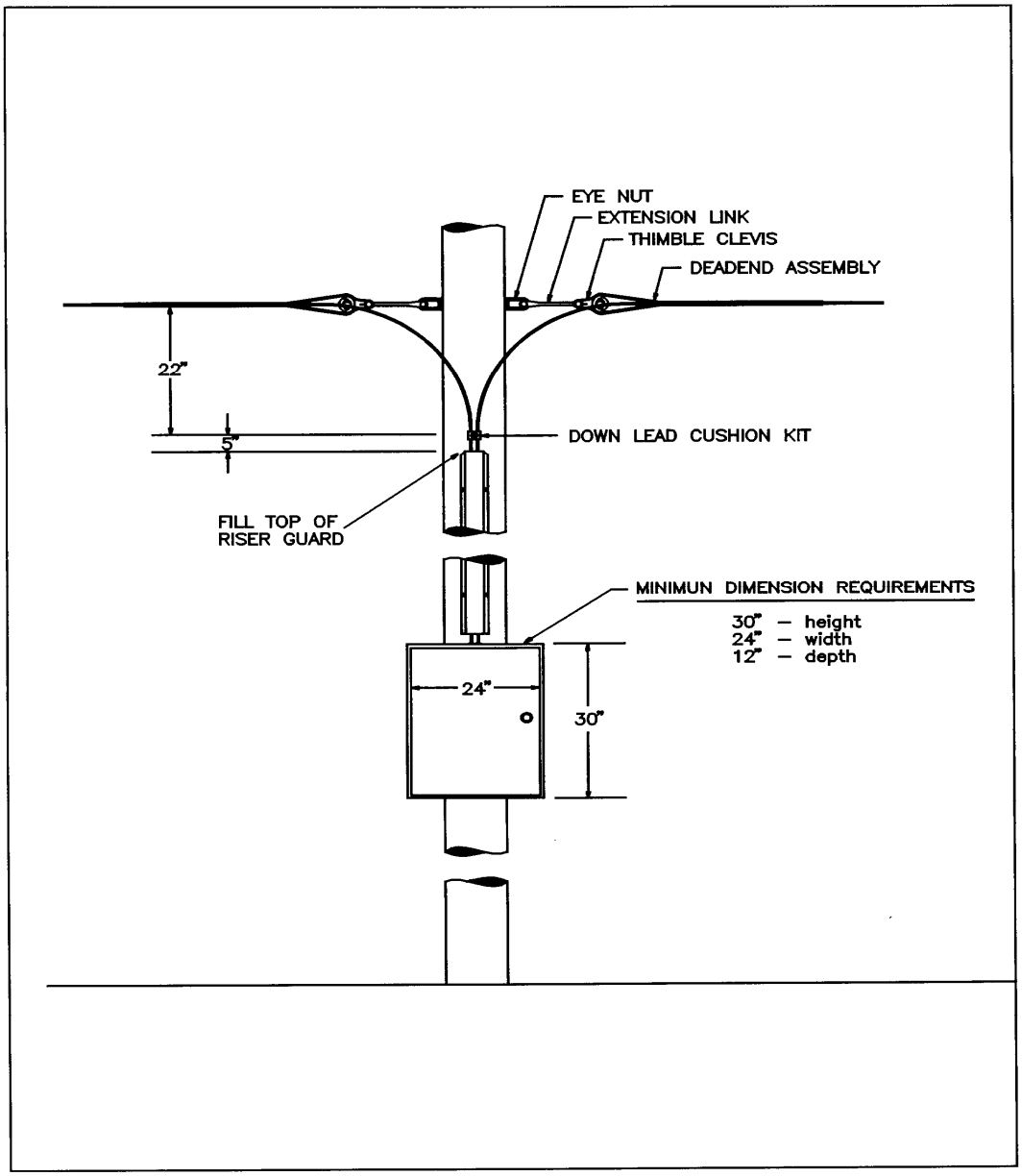


Figure 4 - Aerial Splice Location

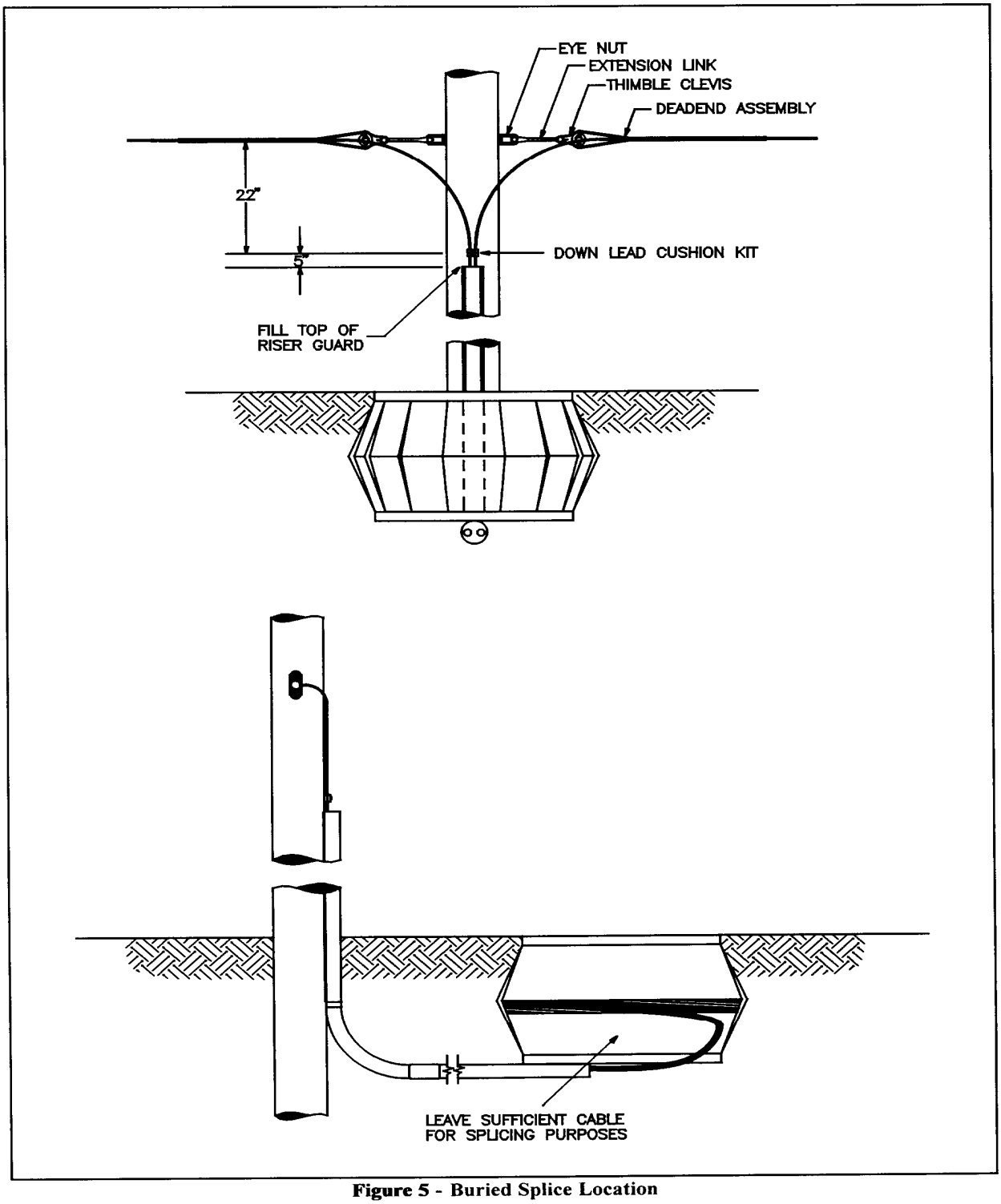


Figure 5 - Buried Splice Location

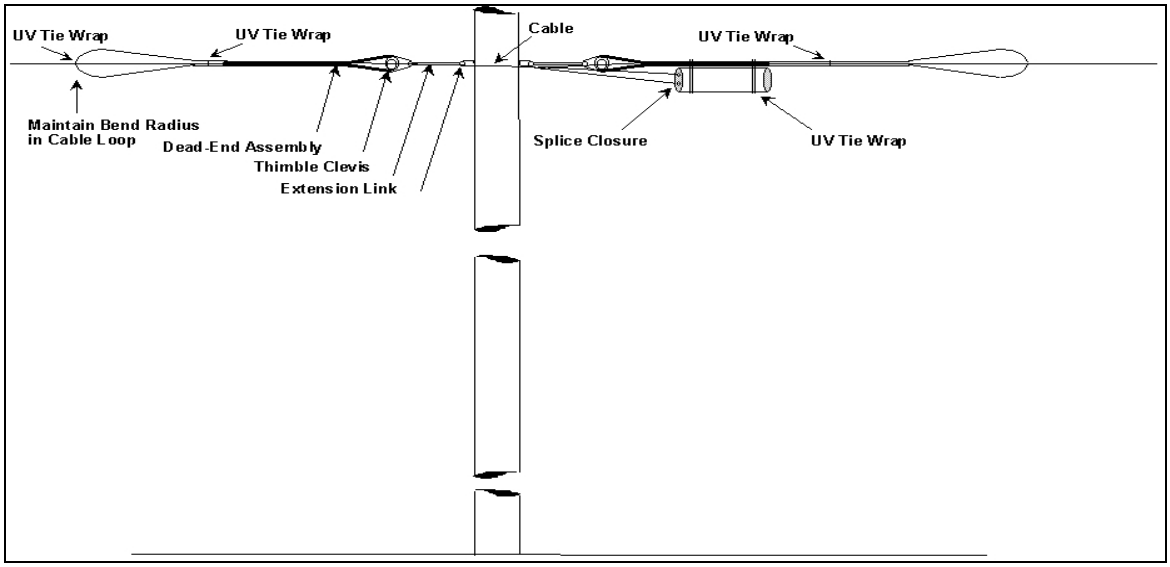


Figure 6 – Cable Storage Loop Using Tie Wraps

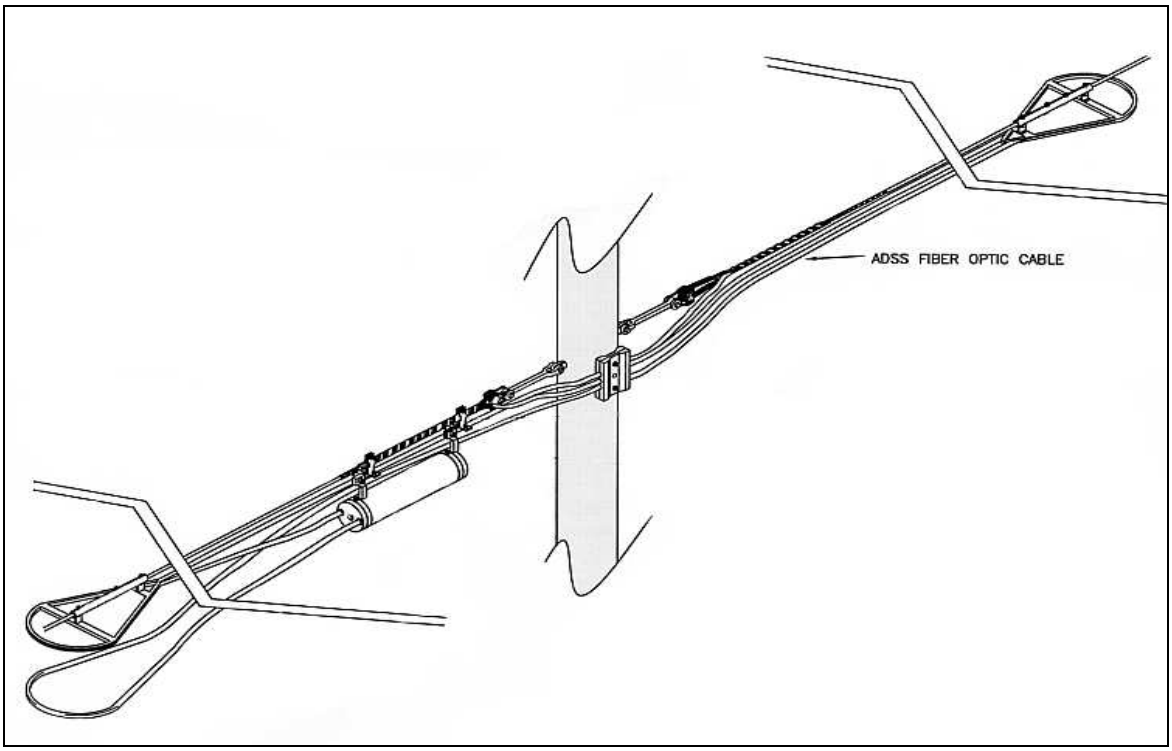


Figure 7 – Cable Storage Using Dulmison Opti Loop

OFS Fitel Applicable Documentation

IP-006 – PowerGuide Sheath Removal
IP-013A – Pulling Grip Attachment Procedure
AN-103 – Interpretation of NESC Codes with Regard to Ground Clearance
Cable Design – Minimum Information Necessary to Design the PowerGuide ADSS
Electric Field – Considerations When Placing ADSS Optical Fiber Cable
AN-810 – Electrical Stress Mechanisms
AN-811 – Recommendations for Electrical Stress Mechanisms
AN-812 – Recommendations for Vibration Damping

To obtain documentation please contact OFS Fitel Technical Services "**Hotline"** at 800 889 3203 or through Customer Service at 800 366 3483 or visit OFS Fitel website at www.fitel.com.