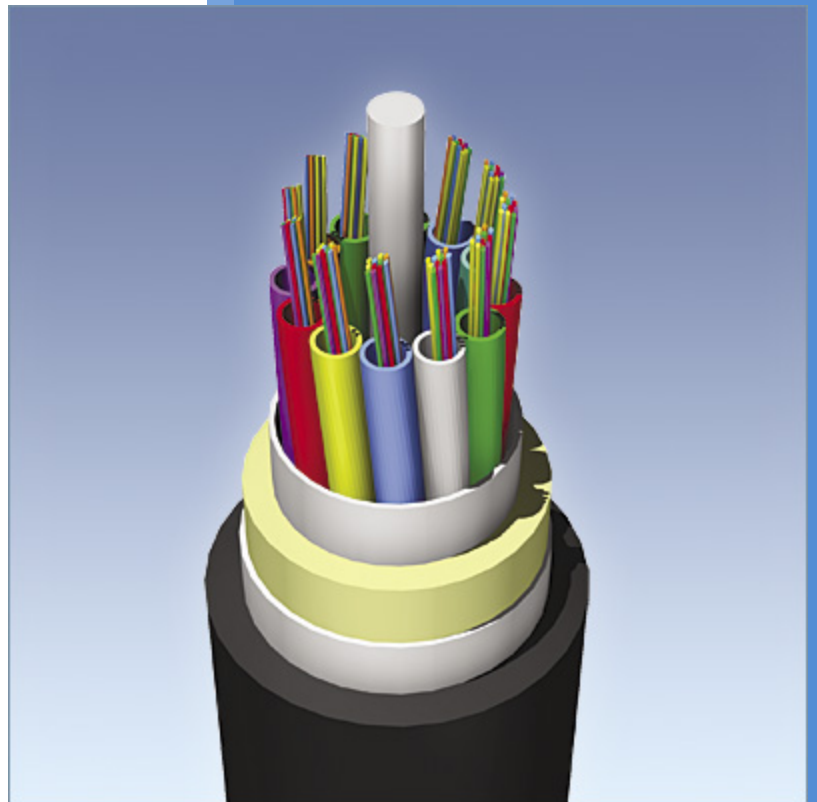




ADSS Cable Installation Manual



ADSS 400m, 96f .

Disclaimer

The information provided in this document is supplied as a guide. Since there are numerous procedures and practices which could be utilized to deploy ADSS Fiber Cable, the procedures outlined are indicative of actual practice. These representations in no way reflect the only methods, tools or materials available to perform the task.

The practices detailed are based on average conditions with little to no gradient.

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ADSS Cable is Self supporting (mainly loose tube) fibre optic cable, hung on existing electrical or telecommunications pole lines. The cable is dielectric, and has no metallic components, and is sold based on spans. Typically the spans are 0-100m, 100-200m and 400m. Selecting the right cable is based on a number of key factors ;

1. Maximum Span Distance between Poles

The greater the distance the stronger the cable needs to be. It is best to use an AVERAGE for the pole line to establish the span (as well as recording the maximum and minimum spans in the pole line). If for example you maximum distance is 105 m and your minimum distance is 55m then an ADSS cable rated 0-100m is sufficient, assuming no other factors).

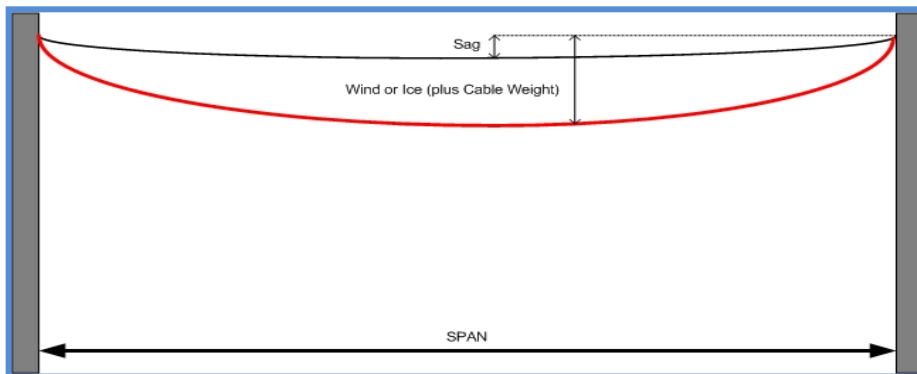


Figure 1: Illustration of Sag and Span in a pole Line

2. Installation Sag

The less sag the better, but to get less sag requires a stronger, stiffer cable. The greater the sag the more movement in the cable post installation and under wind loading. The higher the span rating of the cable the greater tension the cable is able to be placed under.

3. Weather

New Zealand has varying climatic extremes (for such a small country). The important considerations are ;

- i. **Wind Loading** (Higher Winds ; thicker, stiffer cable is required, regardless of span)
 1. High Loading = < 80km/h
 2. Medium = 40 to 80 km/h
 3. Low = > 40km/h
- ii. **Snow / Ice Loading** (, if there is any possibility of ICE or snow then a higher span cable is required to compensate for loading)
- iii. **Temperature** (seasonal variations play a part in the life and performance of the cable if it is going to be in high temperatures in summer and below zero temperatures in Winter then a cable with a thicker outer jacket is required.)

- iv. **UV Light** (New Zealand has one of the highest levels of Ultra Violet light.) To compensate for this the outer jacket of the ADSS cable must have a high percentage of "carbon black" added to the polymer outer jacket material. This results in complete light absorption. The harmful UV rays are absorbed by the carbon particles in the outer jacket and transformed into far less damaging thermal energy. This also prevents the formation of free radicals as well as the occurrence of photo-oxidation). As a guide, the cable should meet (or exceed) the requirements of AS/CA S008 for UV resistance.

4. Line Voltage

As part of any design (and later installation of ADSS cable) it is vital to determine the optimal position of the ADSS cable on the pole to ensure that there is a safe distance from the ADSS cable to the ground and more importantly from the ADSS cable to the phase conductor and to provide safe access to ADSS cable for personnel. Lastly the most important consideration for long term asset management is for the placement of the ADSS cable so as to decrease the electric field, voltage drop and leakage currents along ADSS cable and thus avoid corona sources and partial discharges on its surface that can damage the polyethylene (PE) cable jacket.

Dry band Arcing

Dry band arcing is more likely to occur in specific climatic conditions, namely several months of a hot dry period (summer) followed by a heavy rainy period (autumn in New Zealand). Additionally, if there are nights with fog and or a heavy dew that moistens the air born pollution layer that adheres to the cable jacket transforming it into an electrolytic layer. The air born pollution can come from a range of sources, and air born fertilizer application adds a significant layer of contaminants to the outer jacket. When the pollution layer gets dry a first dry zone (dry band) can be formed on the cable surface. This dry band has an extremely high surface resistance compared to the humid layer. Consequently the potential difference built up along the cable length drops across the dry band. Thus arcing will occur which is deteriorating for the cable sheath. The cable surface pollution layer after the dry period is hard and adheres to the PE jacket, and particularly thick in the area close to clamps.

Coronal Flare

Electric field intensity on the edge of the clamp may exceed the corona onset value; hence corona forms on the clamp edge. As a result, the combined effect of the products of corona and high humidity cause the PE sheathing material to erode. Induced current is a minimum in mid-span rising to a maximum value of leakage current at the end of the clamp. In this region, the cable surface is subject to the maximum temperature creating dry ring zones and partial arcing. Damage in the form of rings is created by partial arcing across the dry band, and damage to the PE with small holes and spongy residues similar to the classical tree pictures found in many tracking and erosion tests

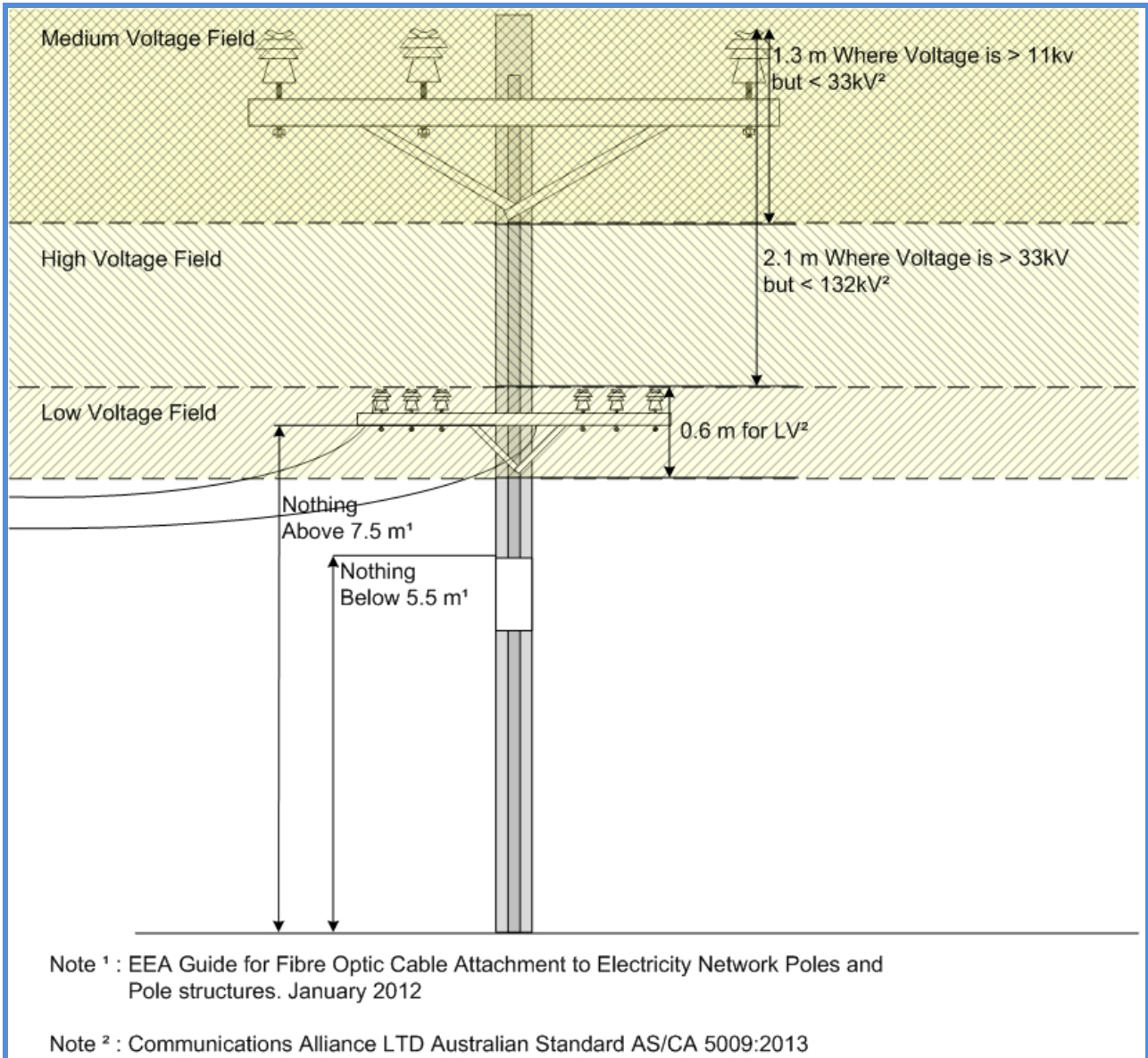


Figure 2: Recommended locations of hanging hardware for ADSS cable (sources noted).

Suspension Hardware

ADSS cable can be hung on pole lines with a variety of different types of suspension hardware, from a range of manufacturers. The key hardware types are;

1. Wire-Wrap Support

These are used Mid Span to give support.

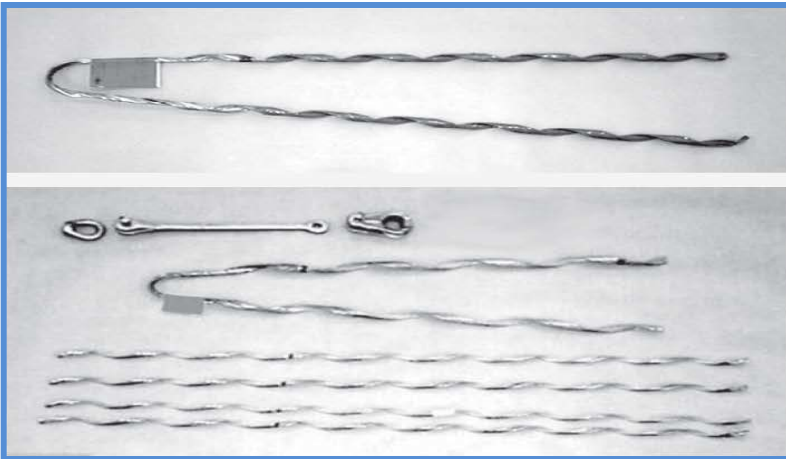


Double ended helical wire wrap with central dielectric insert.

Uses

- Cable angles of Greater than 40°
- Any Span Distance
- Extremely Tight cable Outer Diameter tolerances

2. Dead Ends



Vary in length
Helically wrapped over reinforcing rods
Very tight cable outer diameter tolerance

Uses

- Cable angles of LESS than 30°
- Any Span Distance
- Change in angle of cable, with associated unequal loading
- End of span system
- Un-balanced loads at attachments
- Break up long run of tangents

3. Tangent Supports (Fixed Tangent Support)



Uses

- Holds cable ON POLE.
- Firmly attaches ADSS cable to the pole.
- Aluminum FIXED Anchor.

4. Tangent Suspensions



Uses

- Used to hold cable up on pole (but NOT attached to the pole).
- Cable suspended from shackle.
- Permits movement in cable under wind loading.
- Aluminum Floating with Anchor.

5. Spiral Vibration Damper

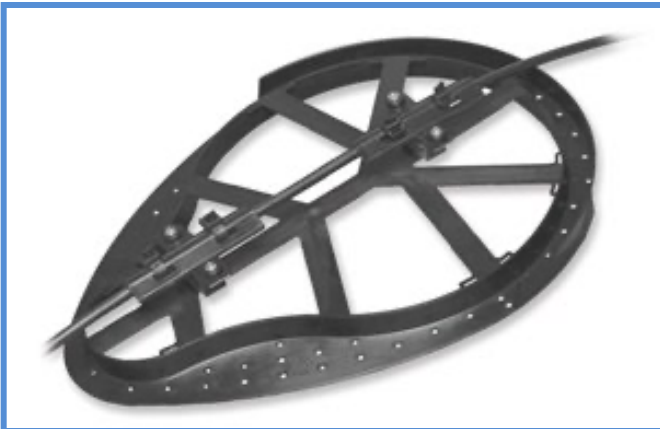


The Spiral Vibration Damper varies in both diameter, length and construction (ie. can be either plastic or Aluminum).

Uses

- Reduces the high frequency, low amplitude vibration caused by horizontal wind passing over (and under) the suspended ADSS Cable (called Aeolian Vibration).

6. ADSS Slack Storage Mount (Snow-Shoe)



Uses

- Provides a mechanism to store excess cable for later use without utilizing a storage vault or underground pit.
- Provides a way to protect the minimum bend radius in the cable whilst to deal with slack.

ADSS Fibre Cable Packaging

ADSS Fibre Cable is supplied on Wooden Reels, and has the following characteristics ;

1. All fibre is supplied with Heat shrinkable end caps to prevent water entry.



(Inner End)



(Outer End)

2. The Drums are always **VERTICAL**, for Shipping and Storage.



3. Reinforcing steel plate dimension

Barrel Diameter	Thick of the plate	Size of the plate
Up to 1000mm	Nom. 4mm	Nom. 180mm
More than 1000mm	Nom. 6mm	Nom. 270mm

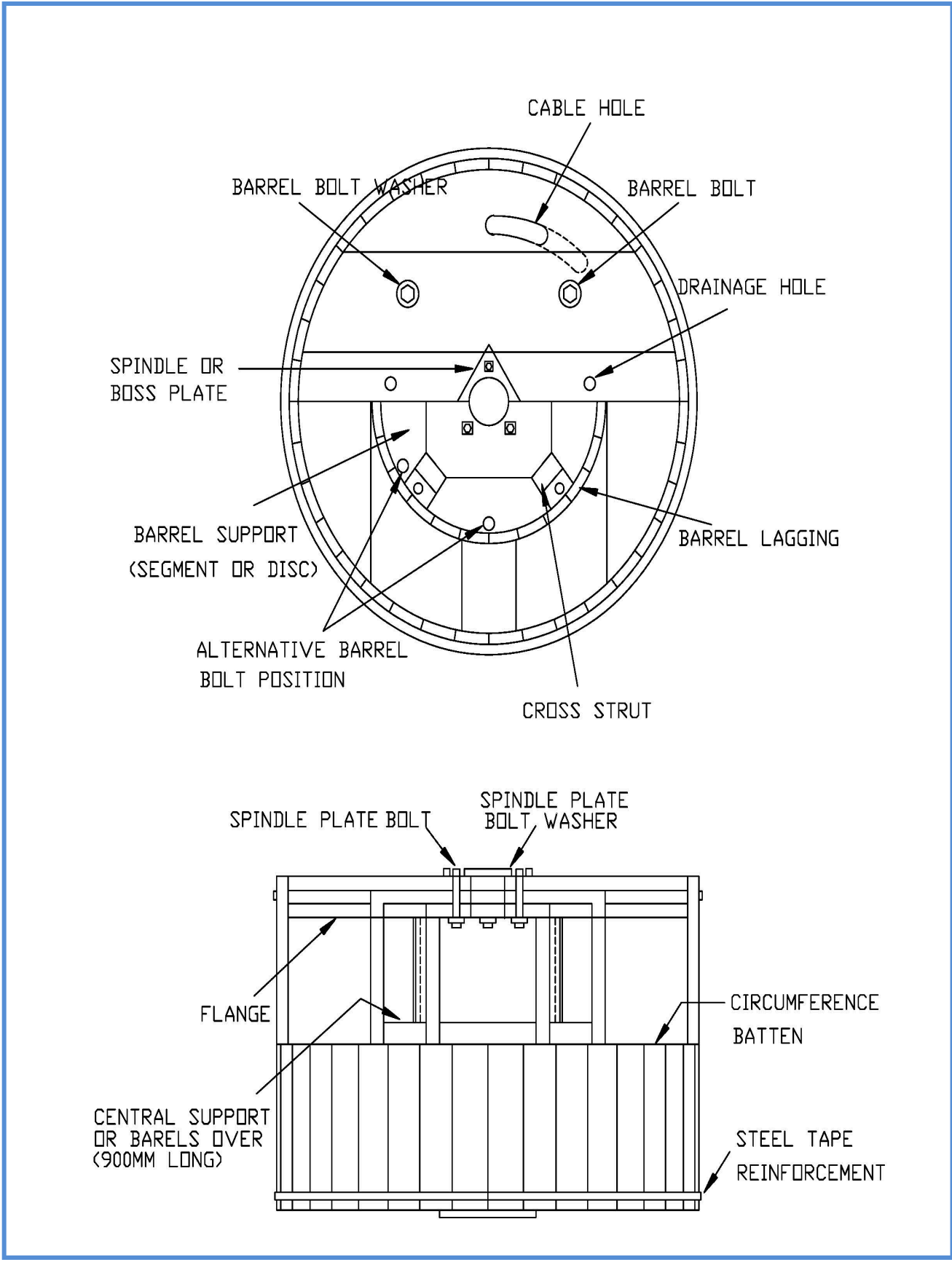
4. All ADSS Fibre Cable is wrapped in an additional layer of plastic prior to adding of the circumference wooden battens*.



5. Outside protection, is achieved by Wooden Circumference battens* and Steel tape.



* All of the wooden materials are heat treated, and fumigated.





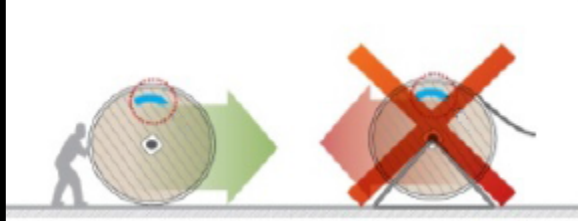
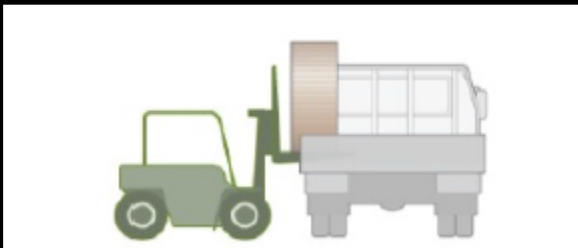
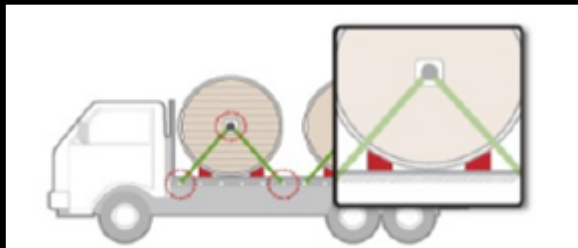
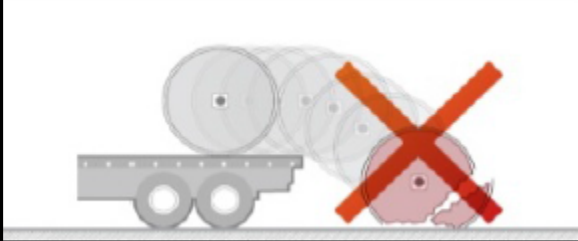

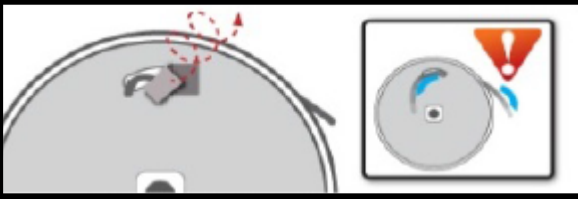
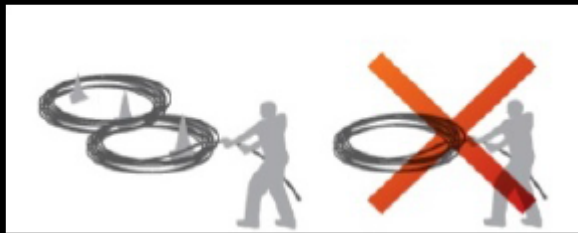
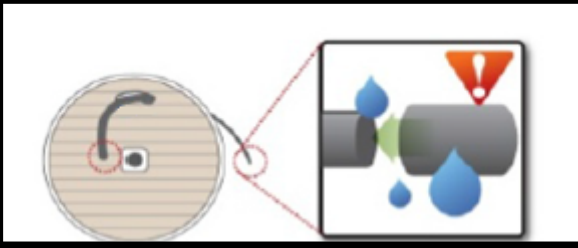
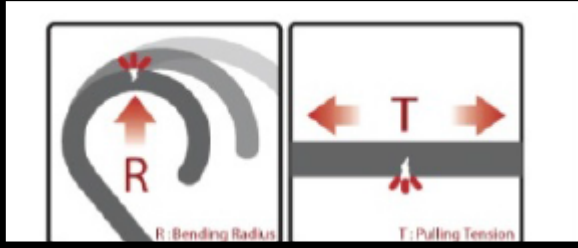
Wooden Reel Sizes Available

[unit : mm]

Reel No	Drum details (Nominal)				
	Flange Dia.	Barrel Dia.	Inner width	Outer width	Spindle hole Dia.
K9-1	1100	600	630	750	110
K9-2	1150	600	630	750	110
K9-3	1200	600	630	750	110
K9-4	1150	700	630	750	110
K9-5	1200	700	630	750	110
K9-6	1250	700	630	750	110
K9-7	1300	700	630	750	110
K9-8	1350	700	630	750	110
K9-9A	1400	700	630	750	110
K9-10	1450	700	630	750	110
K11-1	1400	800	750	900	110
K11-2	1500	800	750	900	110
K11-3	1600	800	750	900	110
K13-1	1500	1000	750	900	110
K13-1A	1550	1000	750	900	110
K13-2	1600	1000	750	900	110
K13-2A	1650	1000	750	900	110
K13-3	1700	1000	750	900	110
K13-3A	1750	1000	750	900	110
K13-4	1800	1000	750	900	110
K13-4A	1850	1000	750	900	110
K14-1	1700	1200	870	1050	110
K14-2	1800	1200	870	1050	110
K14-3	1850	1200	870	1050	110
K14-4	1900	1200	870	1050	110
K14-5	1950	1200	870	1050	110
K14-6	2000	1200	870	1050	110

- We apply BS standard and DEF standard for drum construction, bolt size and etc
- The dimension of drum is nominal value and so, if necessary, it is possible to change the dimension.

ADSS Fibre Cable Handling procedures

 <h1 style="margin: 0;">CAUTION</h1>	
	
<p>Keep drums up-right; Don't lay drum flat on their flanges.</p>	<p>Rolls drums to arrow direction. Arrow IS NOT pulling direction.</p>
	
<p>Use forklift or crane to load/unload cable drums.</p>	<p>Secure drums firmly to prevent from rolling.</p>
	
<p>Don't drop cable drum from any height.</p>	<p>Be careful, Nails on cover can harm your body and/or cable.</p>
	
<p>Before Pulling release cable inner-end freely. Remove steel cover, rope and nails near Exit if any. Re-secure inner-end during pulling at times. The more pull, the more cable comes out.</p>	<p>Figure 8 Coiling Direct loop.</p>
	
<p>Seal the cable end always. Keep the cable from Moisture.</p>	<p>Don't exceed min bending radius and max pulling tension.</p>

Unloading, Moving, and Storing ADSS Fibre Optic Cable with a fork-lift

When unloading the cable reels from the delivery truck, exercising care is important.

Following are guidelines for unloading, moving and storing of fibre cable reels:

1. ADSS Fibre cable reels are typically very heavy and, therefore, they must be loaded and unloaded using a forklift.
2. Forklifts MUST pick the reel up with the flat side of the reel facing the forklift operator.
3. Extend the forks under the entire reel, with the reel resting between the forks (if possible).
4. Keep all reels upright on their rolling edges and never lay them flat or stack them. Optical fiber cable reels are ALWAYS stored on the rolling edge.
5. All reels are marked with an arrow indicating the direction in which the reel must be rolled. Roll only in the indicated direction.
6. The reel is labeled with handling directions. Consult these directions if you have any doubt about handling the reel.

Storage of Fibre

To prevent reel deterioration during long term storage, store optical fibre cable in a manner that protects the reel from the weather. Outside Plant cables may be stored out of doors if reeled onto solid wooden reels. Note: storage out of doors may degrade the appearance of wooden reels due to weathering.

Reels made from particleboard or cardboard must not be stored outside. Water uptake will damage the reels, making it very difficult to payoff the cable.

ADSS Installation Guidelines

The location of the tensioner and puller relative to the structure must be selected so that the pole is not overloaded. Where possible, a pulling slope of approximately 75° is considered good practice. The reason for this is that this ratio will minimize the load on the cable, the traveler, the sheave, and or the quadrant block, and ultimately the pole.

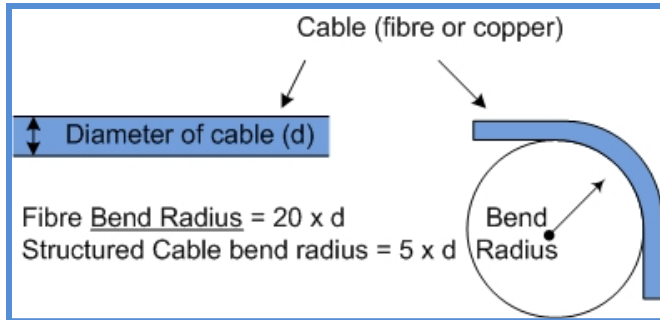


Figure 3: Bend Radius for Fibre and Structured Cabling

It may be necessary to place temporary guys to prevent overloading support poles. The reel must be placed in-line with the first two poles of the run to prevent twisting of the cable or any damage to the cable caused by rubbing the sides of the traveler, sheave, or quadrant block groove.

Anchors and pole hardware must be rated above the expected environmental load of the cable, plus a safety factor. In installations where Aeolian vibration could be an issue, the safety factor should be increased. At locations where the cable is tensioned to achieve proper sag, the pole may require a temporary down-guy and anchor to prevent overloading the pole.

Travelers, sheaves, or quadrant blocks are normally attached directly to the support pole. The pole attachment, used to support the traveler, sheave, or quadrant block must be consistent with the working load and rating of the traveler, sheave, or quadrant block.

The pulling grip shall be rated above the maximum pulling tension anticipated. Use the manufacturer's instructions for the proper application. When properly installed, no special preparation of the cable end, or aramid yarns, are required. A matching clevis type swivel should be used to help prevent twisting of the cable during pull-in. The swivel should be of the type that has a break-away tension less than or equal to the cable's rated maximum pulling tension to prevent over tensioning the cable.

Splice locations require additional cable be provided to accommodate lowering the cable to the ground with enough slack to allow splicing inside a workmans van (typically).

There are two methods used for the installation of ADSS Fibre cable on Pole Lines. The methods are outlined on the following pages.

(a) The “Pull Back” or “Stationary Reel” Method

As its name implies this method uses a stationary reel of ADSS fibre cable, and a pulling rope.

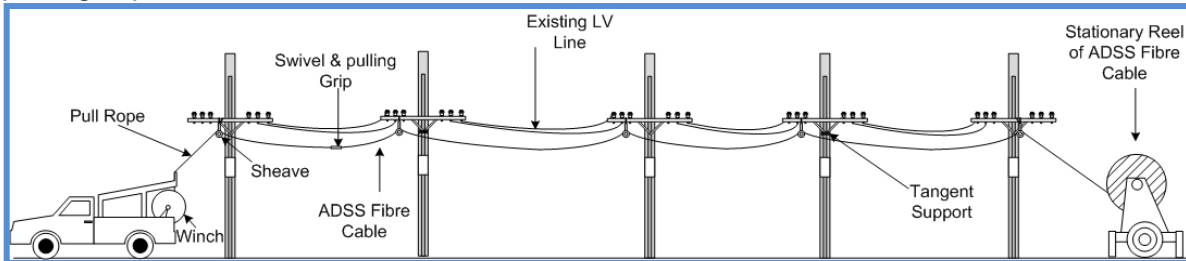


Figure 4: Illustration of Pull back Method for ADSS cable installation

1. Holes are drilled in all poles along the cable run and line pole hardware is attached to the poles at the engineered height. At dead-end and tangent locations, down guys are placed at the correct position according to local engineering practices.

2. Travelers, sheaves, or quadrant block are placed just above or just below the location of the installed pole line hardware at each pole location. The diameter of these supports must meet the minimum bend radius specs for the cable in any location where the cable will be bent more than 20 degrees. The cable warranty is void if these limits are not observed.

Please note that if tension is let off the cable during a pull, the natural sag of the ADSS cable is likely to produce angles larger than 20 degrees at each support point. Therefore extreme caution must be used when pulling ADSS cable if pulling through small diameter supports.

3. The pulling line is then pulled through each traveler, sheave, or quadrant block. After the pulling line is in place, it is attached to the ADSS cable with a break-away swivel and a wire mesh grip (or pulling sock).

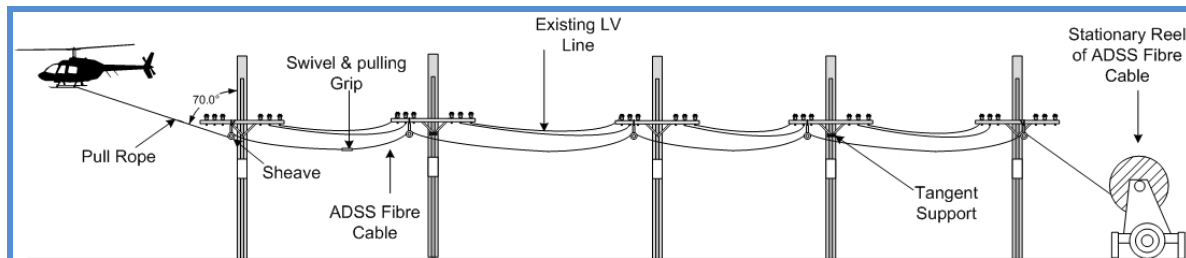


Figure 5: Illustration of Pull back Method (utilizing a Helicopter) for ADSS cable installation

4. The ADSS cable is then pulled in through the entire section using the puller and the tensioner. Care must be taken to avoid over tensioning the cable and to avoid sagging of the cable that may introduce bends that are smaller than the minimum bending radius of the cable. Several pulling stages may be required to place the cable through the entire system.
5. When the entire ADSS cable has been pulled into place, starting at an end location, each dead-end to dead-end cable length can be sagged and tensioned and support hardware applied according to the installation requirements.

(b) The “Moving Reel” or “Drive Off” method

The Drive-out method of cable placement is primarily used during the construction of new lines where there is a clear right-of-way and with no obstructions to vehicles.

1. The reel of cable is placed on a reel trailer or a truck equipped with a reel carrier. The cable should play off the top of the reel for reel trailers and the bottom of the reel for trucks equipped with a reel carrier. The reel trailer or reel equipped truck should have a braking device, set on minimum. The brake is used to prevent overrun of the reel when stopping at the support poles.
2. Holes will have to be drilled at the poles to mount the support hardware. At dead-end and tensioning locations, down-guys of the correct loading factor are to be placed according to local engineering practices.
3. Travelers, sheaves, or quadrant blocks are placed above or below the pole mounting hardware at each pole location.

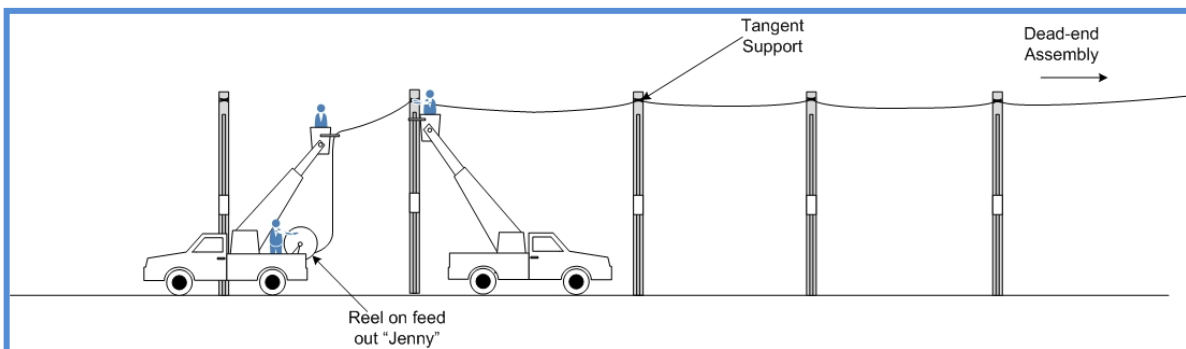


Figure 6: Illustration of the Moving Reel Method for ADSS cable installation

4. With the ADSS cable “deadended” at the starting location and minimum tension applied to the reel brake, the reel of cable is transported along the construction route while the cable is played out.

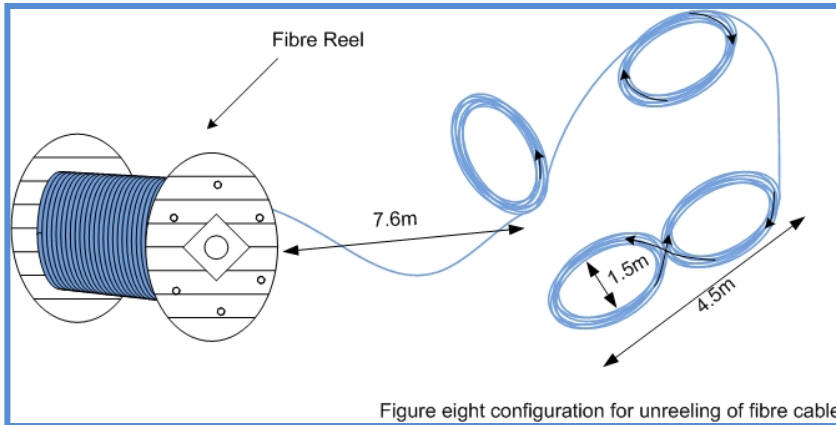


Figure 7: playing out of fibre cable into “figure 8”

5. As the reel passes a pole location, the trailer or truck must be stopped while the cable is placed into the traveler, sheave, or quadrant block attached to the pole.
6. The reel then travels on to the next pole where the process is repeated over again. This continues until the cable is completely deployed or a dead-end is reached.
7. With the ADSS cable deployed, each span must be sagged and tensioned with supporting hardware installed. Each span is started at the dead-end and slack worked back towards the opposite end. An alternative method is to sag and tension each span and install permanent hardware as the cable is being deployed.

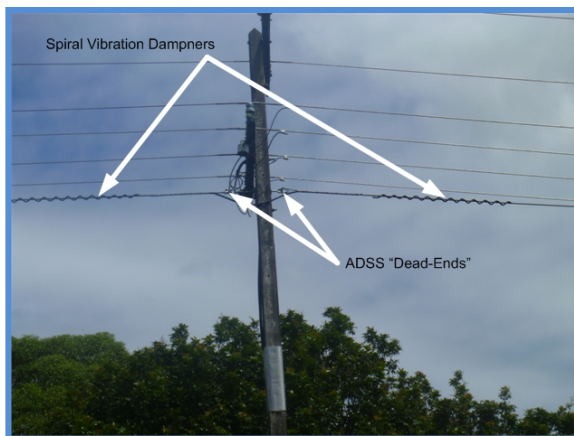


Figure 8: Local ADSS installation showing dead ends and Spiral Vibration Dampers

Tensioning of the ADSS Cable

After the proper amount of cable has been placed in temporary support hardware between the dead-end poles, the cable must be properly tensioned before it is permanently secured into tangent assemblies.

1. With a dead-end fitting already in place on one end of the span, the cable is tensioned by pulling on its opposite “free” end with a chain hoist (come-along).

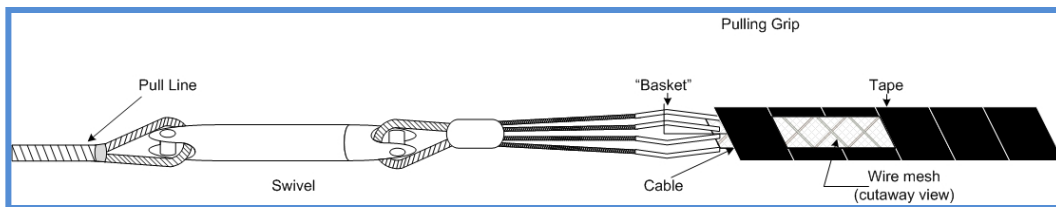


Figure 9: Pulling Grip & Swivel

2. Once the cable sections are under the required tension, the “free” end of the cable is terminated into a dead-end. Before beginning this stage of the installation, any pole modifications or additional temporary/permanent guying must be completed.
3. Proceed to the end of the pole line section which does not have a dead-end fitting already in place from the cable installation procedure. Pull out all cable slack between the dead-end poles.
4. Install a temporary dead-end approximately 3 to 4 m away from the pole.
5. Set up the temporary dead-end, a chain hoist, an in-line dynamometer. Typically, the chain hoist is strapped to the dead-end pole as per Figure 10 on page 21.
6. Apply tension to the cable with the chain hoist. During the tensioning operation, stay within the limits of maximum pulling tension for the cable and the strength of the poles themselves. For long spans under high tension, it may be necessary to use two chain hoist temporary dead-end set-ups in succession to take out the slack and achieve the necessary tension.
7. The tension can be initially monitored at the dead-end pole with the dynamometer. When tensioning several straight spans (with few offsets), it may be necessary to false dead-end the cable despite the pole offset being less than 20 degrees. This may be necessary to ensure that a 1% installation sag is maintained for all spans. Friction built up on some of the blocks or J-hooks on the far end of the tensioning operation may cause greater than 1% sag in those spans.

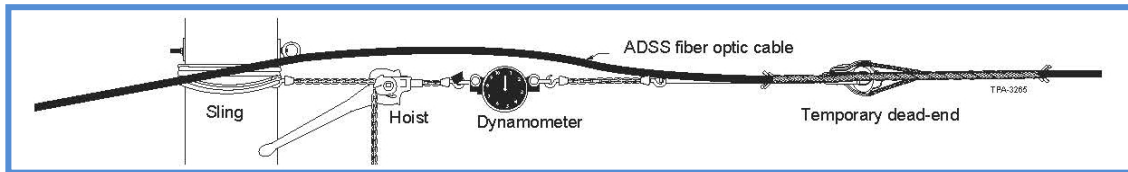


Figure 10: Tensioning ADSS cable with in-line Dynamometer. (Source: Synergy Cable Co)

8. The number of spans between false dead-ends will vary, depending on the route and span lengths, but up to 20 straight pole spans are typical before false dead-ending is necessary.
9. Once the cable section is under the required tension, terminate the cable into a dead-end. The dead-end should be placed on the cable where it reaches the pole fixture, unless allowances are being made for grade changes or turns.

Tensioning Across Turns And Grade Changes

The cable run may extend across turns and gradient changes in the pole line. Since ADSS cable is normally placed in the permanent support hardware after tensioning, has been completed, any change in pole line direction complicates the process.

a. Cable on inside of turn:

As the cable in this situation is tensioned, the cable will naturally tend to pull inside of the corner pole. A horizontally mounted stringing block will keep separation to a minimum tension the cable in stages:

- Tension the cable to the degree planned from the dead-end pole.
- While monitoring the tension, move the cable from the temporary support hardware at the inside turn to the cable's permanent support hardware on the pole.
- As the cable is pulled out to the pole, tension will increase.

Take care not to exceed the maximum pulling tension of the cable or the capacity of the poles and hardware. It may be necessary to relieve tension by backing off with the chain hoist at the dead-end pole. Continue this process until the cable is in place on the pole at the inside turn.

b. Cable on the pole at a grade change:

The procedure used to tension the cable across a change of grade is similar to that used on an inside turn. The cable will pull up or down, depending on the direction of the grade change, rather than horizontally as is the case on an inside turn. Temporary support hardware must be mounted accordingly.

Cable Specification

As an example an ADSS Cable specification is listed below in table 1.

		121062A(Rev.1)
FRP	size	Nom. 3.5mm FRP
Aramid yarn	kg/km	Nom.15
Cable	Diameter	Nom.15.6mm
Cable tension	Stringing	Can be 350kg
	Max. rated cable	772kg
	Breaking	1,371kg

Using the NESC loadings and the cable weight and diameter the following data is available as to sag and tension

Fibre Count	Installation Parameters			NESC LIGHT Loading		NESC MEDIUM Loading		NESC HEAVY Loading	
	Span (m)	Sag (%)	Tension (kgf)	Sag (%)	Tension (kgf)	Sag (%)	Tension (kgf)	Sag (%)	Tension (kgf)
74-96	200	1	466	0.8	666	2.4	816	3.3	1174
	220	1	514	0.8	725	2.4	884	3.4	1265
	240	1	561	0.8	783	2.5	952	3.5	1354
	260	1	608	0.8	840	2.5	1018	3.5	1441
	280	1	655	0.8	897	2.5	1083		
	300	1	701	0.8	954	2.6	1147		
	320	1	748	0.8	1010	2.6	1211		
	340	1	795	0.8	1065	2.6	1274		
	360	1	842	0.8	1121	2.7	1336		
	380	1	888	0.8	1175	2.7	1398		
	400	1	935	0.8	1230	2.7	1459		
	420	1	982	0.9	1284				
	440	1	1029	0.9	1338				