



Incab

ADSS Engineering 201

Accessories

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Registered Continuing Education Program

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PURPOSE STATEMENT / COURSE DESCRIPTION

- ADSS Engineering 201 – Accessories will teach attendees about accessories that are used with ADSS to complete a system.
- Special attention will be given to dead-ends and suspensions/supports since these are especially critical.



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LEARNING OBJECTIVES

After this class you will be able to:

- Identify the **two basic ADSS dead-end types** and why one of them is generally preferred
 - Know the classifications used for dead-ends and how to apply these
 - Understand “**tension coupling**” and its importance to dead-end functionality
- Identify the **two basic types of ADSS suspensions/supports** and state the advantages/disadvantages of each
- Identify the type of **vibration damper** used for ADSS and state why it should be used
- Identify the **three basic types of splice enclosures** and know the considerations that go into selecting a good one.
- Identify **other important items** that your project might need.

Incab University “School of Excellence in Fiber Optics” curriculum

Learning Hub



[INCABAMERICA.COM](https://www.incabamerica.com)

Webinar Rules

- Introduction and sound check
- Presentation: 50 min
- Use chat for questions during presentation
- Q&A (NB! Technical questions only): 10 min
- Let's start!

ADSS Accessories Background



Recall that for ADSS, there are “Two” many choices? (sometimes even three or more!)

- Jacket Configuration. Double vs. Single
- Jacket Material. High Density Polyethylene (HDPE) vs. Medium Density PE (What about Low Density PE?)
- Strength Material. Aramid (Kevlar) vs. Fiberglass (or Fiberglass Reinforced Plastic (FRP) rods)
- Core Design. Dry vs. Flooded (gel-filled = “Wet”)
- Tube Design. Dry vs. Flooded
- Fibers per tube. 12 vs. 24 (others are possible too)
- Tube Material. Polybutylene Terephthalate (PBT) vs. Polypropylene (PP)
- Outer jacket adhesion to the strength element. Coupled vs. De-coupled

Feeling anxious? Relax!
Despite the very wide range of design types, selecting the right accessories is easy!

ADSS Accessories

General



- ADSS dead-ends, suspension clamps or supports, and other accessories are specially designed to limit radial pressure on the cable
- “Historical” lead-time* is Stock - 8 weeks

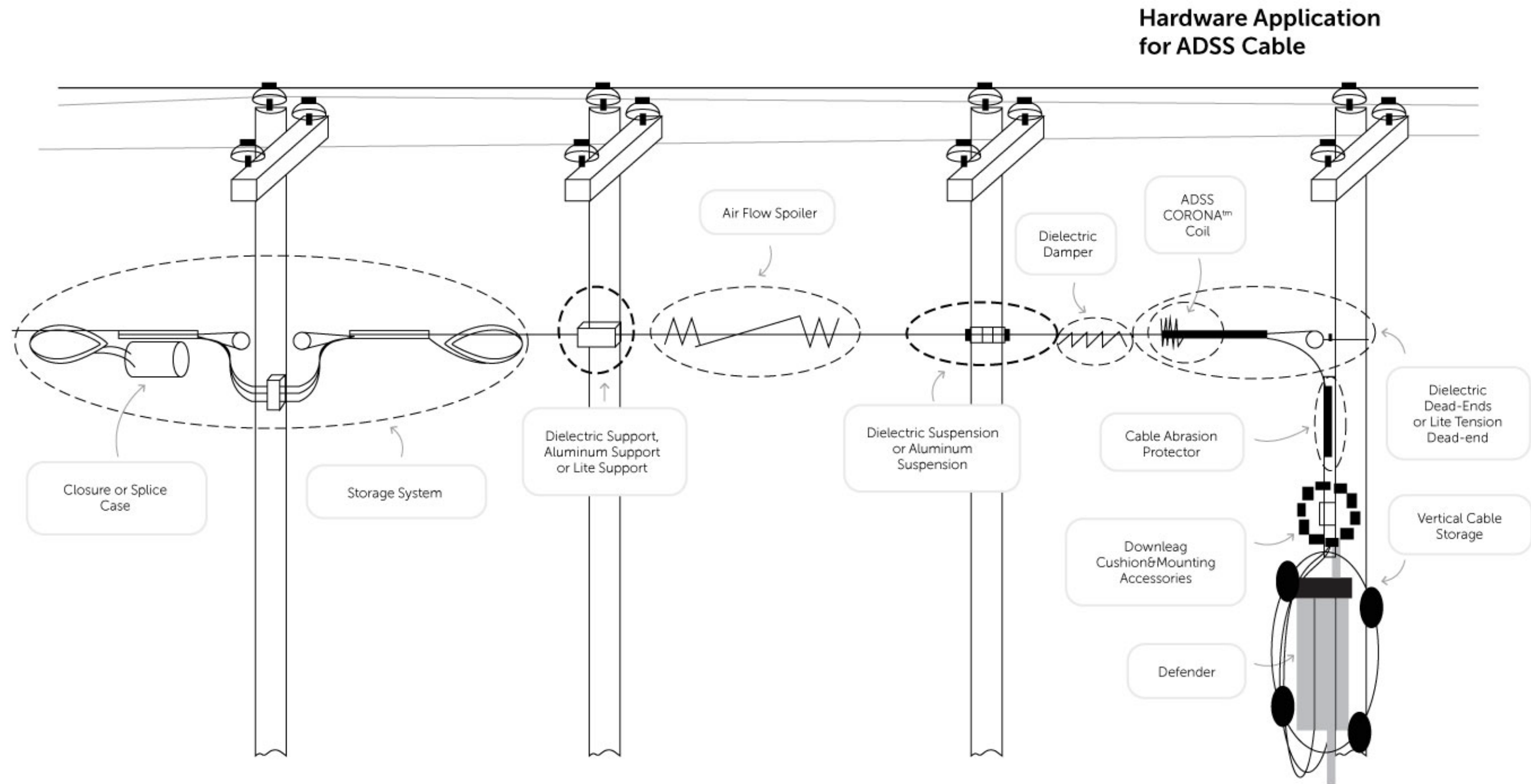
Note:

- I have shamelessly copied and pasted pictures from various suppliers that I found on-line for this presentation. I offer my appreciation for those that do not mind this, and my apologies for those that do.
- A ✓ beside an item means that it has earned the much coveted “**Mike Likes**” rating.

* = meaning “Before all the craziness of the last two years”

ADSS Accessories

System Overview. Major Accessories Schematic



ADSS Accessories

System Overview. Major Accessories List

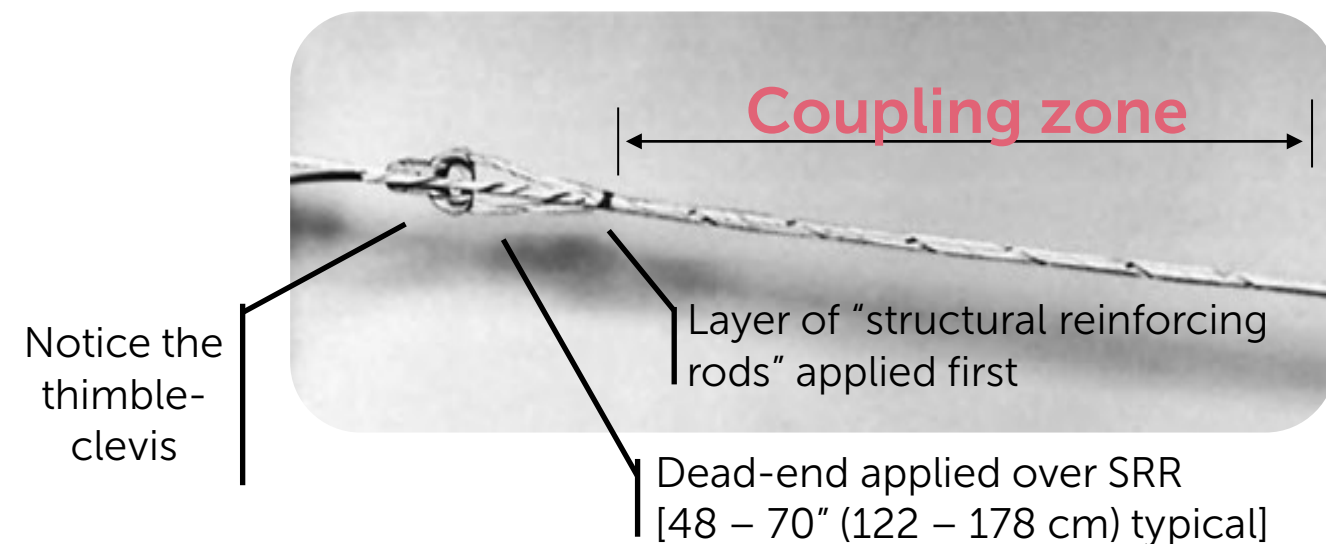
- **Dead-ends.** Two basic options:
 - Formed Wire (4 ratings + TR)
 - Wedge
- **Suspensions/Supports.** Two basic options:
 - Supports, with two styles
 - Suspensions, with three styles
- **Connection options.**
- **Dampers.** One option: SVD's (spiral vibration dampers)
- **Downlead clamps.** Two options: Urethane or aluminum
 - Consider: mounting options
- **Splice enclosures.** Lots of options!
 - Consider: Bullet resistance? Cable storage
- **Other important items you may need:**
 - "Snowshoes" for in-span cable storage

Let's look at each item...

ADSS Accessories

Dead-ends. Formed Wire Type

- Formed Wire, similar design concept as a guy grip



"Coupling zone" is essential for long-term performance – longer means smoother transition of tension in the cable to the dead-end

- Advantages:
 - Very inexpensive
 - Excellent availability
 - Best tension coupling (over ft/mtrs)
- Disadvantages:
 - Can be quite long (over 8 ft (2.4 m)!) (so, may not be able to install from a pole)
 - Length makes installation harder
 - Takes the longest to install

ADSS Accessories

Dead-ends. Wedge Type

- **Wedge Type** ❌



- **Advantages:**

- Easier to install
- Inexpensive

- **Disadvantages:**

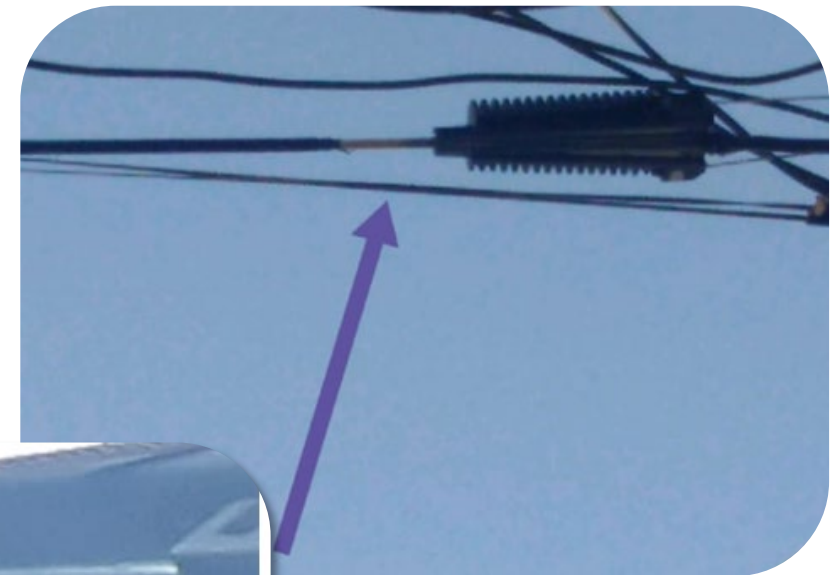
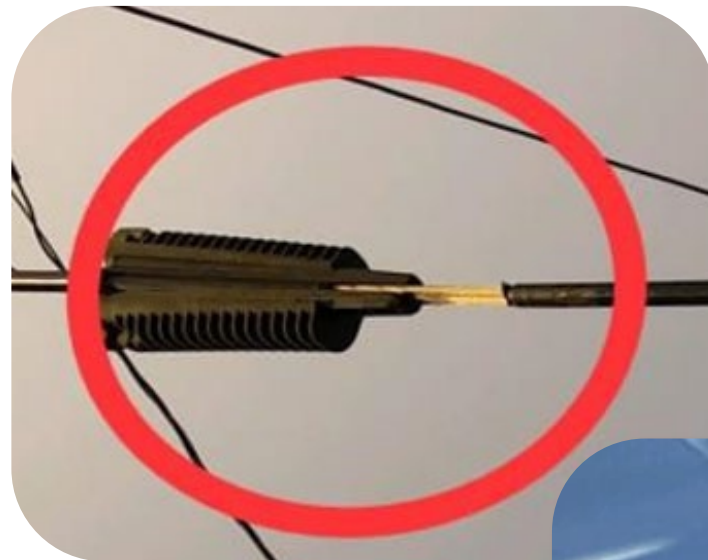
- No rods to protect the cable
- Much shorter "coupling zone" (inches/cm)
(Stress concentrates near the mouth)
- Problems under "real world" conditions
(Leading to slippage or jacket tears)



Suggest you avoid this type

ADSS Accessories

Dead-ends. Problems in the Field



Such damage in the field is not always caused by the wedge type nor the fault of the dead-end, but...



ADSS Accessories

Dead-ends. Ratings

Five ratings, plus special consideration for track-resistant (TR) jackets

- Light (“Lite” or “Mini”)
- Limited
- Medium
 - Most TR jackets too (must check!)
- High
 - Most TR jackets too (must check!)

ADSS Accessories

Dead-ends. How to Select

1. Match the cable's "maximum rated design tension" (MRDT = maximum rated cable load (MRCL)) with the dead-end's maximum loaded tension
2. Match the cable's outside diameter (OD) with the range of the dead-end

Note!

If your ADSS has a track-resistance jacket, then you must work with *both* the dead-end manufacturer *and* the cable supplier

- Tend to be longer spans (which means "be careful")
- Concern about the jacket material (which also means "be careful")

Example coming up soon!



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Dead-ends. How to Select, General Guides

- Light (“Lite” or “Mini”) – All of the following apply
 - Cable MRDT \leq 800 lb (3.5 kN)
 - Spans \leq 300 ft (91 m)
 - Standard PE jacket (LDPE, MDPE, HDPE)
 - Not a critical crossing span (highway, rivers, etc.)
 - Upgrade to Limited
- Limited – All of the following apply
 - Cable MRDT \leq 2,500 lb (11.1 kN)
 - Spans \leq 600 ft (183 m)
 - Standard MDPE or HDPE jacket
 - Not a critical crossing span (highway, rivers, etc.)
 - Upgrade to Medium

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Dead-ends. How to Select, More General Guides

- Medium

- Cable "everyday" tension (no ice, no wind) $\leq 2,000$ lb (8.9 kN)

- Cable MRDT $\leq 4,000$ lb (17.8 kN)

- Standard MDPE or HDPE jacket

- + TR jacket *if approved by both* the cable and dead-end manufacturers

- OK for critical crossing span (highway, rivers, etc.)

- Heavy

- Cable "everyday" tension (no ice, no wind) $> 2,000$ lb (8.9 kN)

- Cable MRDT $> 4,000$ lb (17.8 kN)

- Standard MDPE or HDPE jacket

- + TR jacket *if approved by both* the cable and dead-end manufacturers

- OK for critical crossing span (highway, rivers, etc.)

- For Track-Resistant (TR) jacket

- Always coordinate with *both* the cable and the dead-end manufacturers

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Dead-ends. How to Select, Example – Step 1A

- Excerpts from a typical ADSS cable datasheet...

Cable consists of stranded core with central strength member (FRP), dry loose tubes with optical fibers and PE filler (black color). Stranded core is fixed by water-swallowable yarns. Water-swallowable tape is laid over stranded core. Inner jacket is made of MDPE. One ripcord is laid under inner jacket. Aramid yarns are laid over inner jacket. Outer jacket is made of MDPE. Two ripcords are laid under outer jacket. Meets IEEE 1222-2011.

Design details		
Fiber count		48
Number of loose tubes		4
Fibers per loose tube		12
Number of PE fillers		2
Loose tube diameter	mm (in)	2.7 (0.106)
Inner jacket thickness	mm (in)	0.7 (0.028)
Outer jacket thickness	mm (in)	1.55 (0.061)
Cable diameter ± 0.2 (0.008)	mm (in)	13.1 (0.516)
Cable weight	kg/km (lb/ft)	116.1 (0.078)
Maximum rated design tension	kN (lb)	7.0 (1574)
Zero fiber strain margin	kN (lb)	5.6 (1259)
Stringing tension (STT)	kN (lb)	1.75 (393)
Rated breaking strength (RBS)	kN (lb)	11.5 (2586)

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Dead-ends. How to Select, Example – Step 1B

- Excerpt from an ADSS dead-end cut-sheet...

Limited Tension Dead-ends:

Intended for relatively low tension application usually associated with short span construction. They are not cable or line design specific but are designed to fit broad diameter ranges. Holding performance will vary by specific cable brand and operating conditions. Therefore, no specific holding strength rating is possible.

In general, Limited Tension Dead-ends are intended for use with these conditions and limitations:

- Low tensions, approximately:
 - 1,000# (4.4kN) maximum initial (stringing/nominal axial/long-term) tension
 - 2,500# (11.1 kN) maximum loaded (working/loaded axial/short-term) tension

- Cable MRDT = 1,574 lb < Dead-end max. load = 2,500 lb
- Limited Tension dead-end is OK (Assuming application is not a critical crossing span)

Shout-out to Preformed Line Products

ADSS Accessories

Dead-ends. How to Select, Example – Step 2A

- Excerpt from a typical ADSS cable datasheet...

Design details		
Fiber count		48
Number of loose tubes		4
Fibers per loose tube		12
Number of PE fillers		2
Loose tube diameter	mm (in)	2.7 (0.106)
Inner jacket thickness	mm (in)	0.7 (0.028)
Outer jacket thickness	mm (in)	1.55 (0.061)
Cable diameter ± 0.2 (0.008)	mm (in)	13.1 (0.516)
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Rated breaking strength (RBS)	kN (lb)	11.5 (2586)



ADSS Accessories

Dead-ends. How to Select, Example – Step 2B

- Excerpt from an ADSS dead-end cut-sheet...

Limited Tension Dead-ends				
Catalog Number*	Cable O.D. Range (inch)	Cable O.D. Range (mm)	Overall Length in. (m)	Color Code
2872001	.400-.424	10.1-10.7	48 (1.2)	Black
2872002	.425-.451	10.7-11.4	48 (1.2)	Yellow
2872003	.452-.481	11.4-12.2	48 (1.2)	Green
2872004	.482-.510	12.2-12.9	48 (1.2)	Orange
2872005	.511-.542	12.9-13.7	48 (1.2)	Blue
2872006	.543-.577	13.7-14.6	48 (1.2)	White
2872007	.578-.613	14.6-15.5	48 (1.2)	Red
2872008	.614-.651	15.5-16.5	48 (1.2)	Black
2872009	.652-.692	16.6-17.5	48 (1.2)	Yellow
2872010	.693-.737	17.5-18.7	48 (1.2)	Green
2872011	.738-.784	18.7-19.9	48 (1.2)	Orange
2872012	.785-.834	19.9-21.1	48 (1.2)	Blue

- Correct catalog number is: #2872005

Shout-out to Preformed Line Products

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Supports



versus

Suspensions





ADSS Accessories

Supports vs Suspensions

- Supports are fixed, so the ADSS cable must withstand any tension difference caused by a span or wind/ice loading differential
 - Suggest limiting use to ≤ 300 ft (91 m)
 - Suggest not to use for pulling-in (distribution class stringing block is better)
 - Is it really a good idea to drag your cable through a support?
 - Should be approved by the cable manufacturer
- Suspensions articulate, and even a small amount greatly relieves a tension imbalance
 - Suggest use for all spans
 - Strongly recommended for spans > 300 ft (91 m) and for all critical crossings

ADSS Accessories

Support Clamps

- Urethane

 - Spans ≤ 300 ft (91 m) for "Lite" version

 - Spans 300 – 600 ft (91 – 183 m) for standard version

 - Check that vertical load $\leq 1,000$ lb

 - Line angle or elevation changes $\leq 20^\circ$

 - Attach using a through bolt or banding (with adapter)

- Aluminum

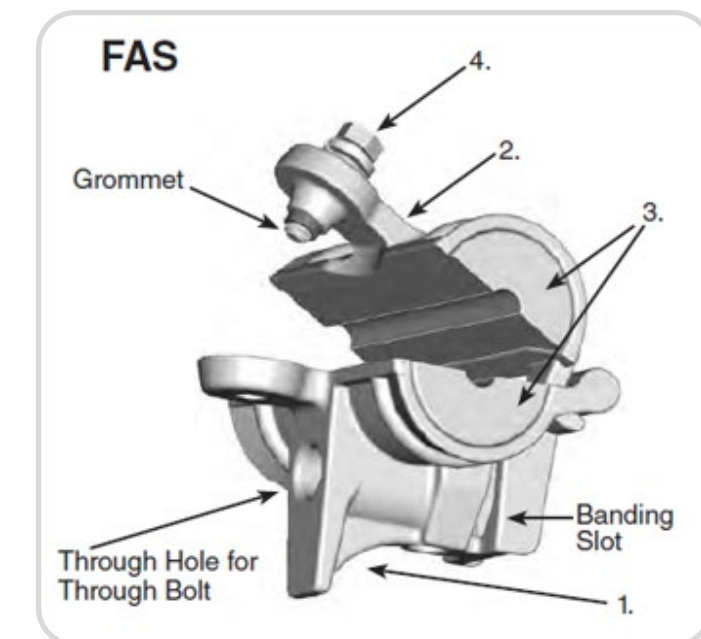
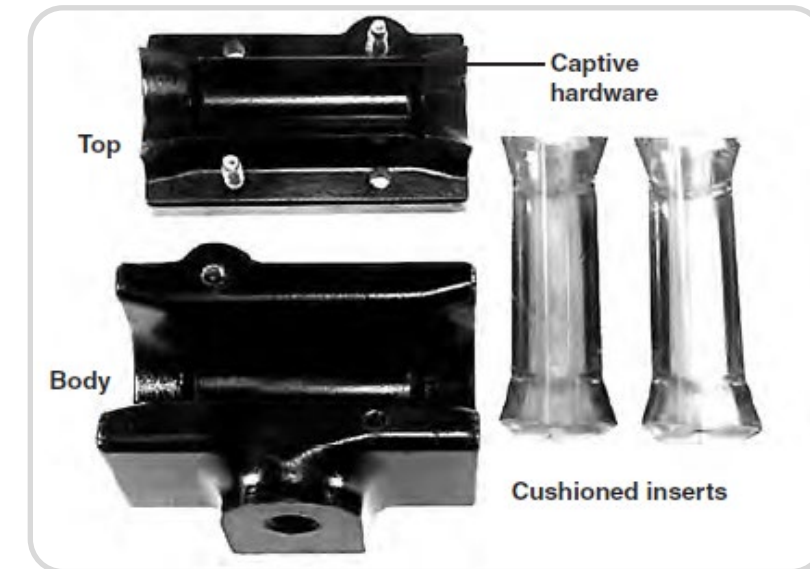
 - Spans 300 – 600 ft (91 – 183 m)

 - Check that vertical load $\leq 1,000$ lb

 - Line angle or elevation changes $\leq 20^\circ$ Standard

 - Attach using a through bolt or banding (adapter not required)

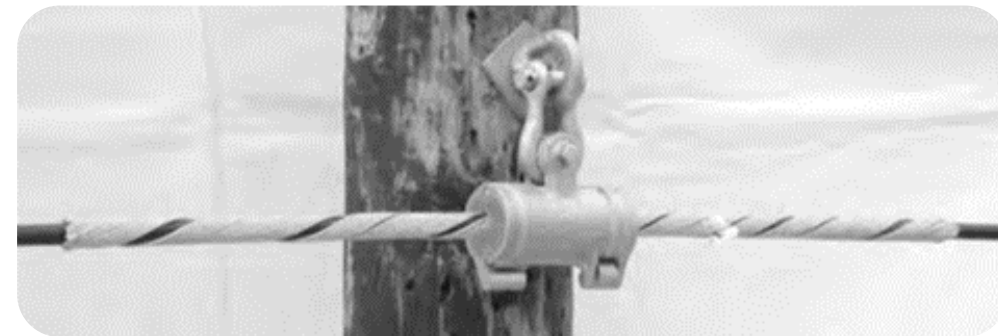
Note! Bolt/adapter must be perfectly perpendicular to the line or "Z effect" occurs!



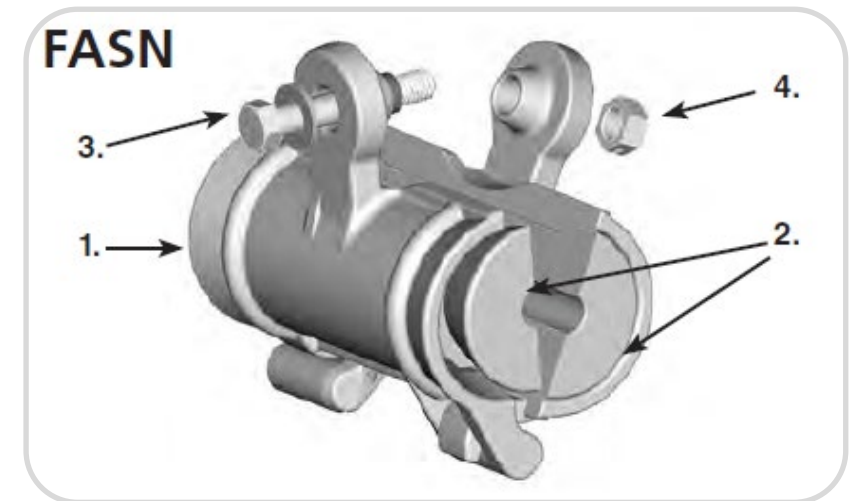
ADSS Accessories

Suspension Clamps

- ✓ ● Suspension
 - Spans \leq 600 ft (183 m) without rods
 - Spans \leq 1,200 ft (366 m) with rods
 - Rods accept corona coil (TR jacket)
 - Line angle or elevation changes \leq 30°



- AGS Style Suspension
 - Spans to at least 1,200 ft (366 m)
 - Greater need to be checked with both the cable and the accessory suppliers
 - Rods accept corona coil (TR jacket)
 - Line angle or elevation changes \leq 40°



Notes:

- A. Attach using a shackle or link to a s/w bracket or eye nut + through-bolt combination, or to a banding adapter
- B. Vertical load is a concern only in unusual circumstances (large OD + very long spans + heavy wind/ice loading \rightarrow 5,000 lb or more), or when attached using a banding adapter (1,200 lb).

ADSS Accessories

Connection Options

All of the preceding accessories require pole line hardware to attach to the structure

- **Dead-ends**

Most common: Clevis-eye extension link



- Plus, an eye nut to a through-bolt →



- When using a formed wire type dead-end, make sure it comes with a thimble clevis (most do) →

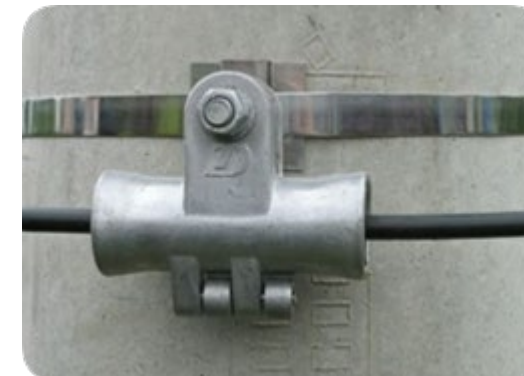


- **Suspensions**

Most common: Shackle or link to an eye nut + through-bolt combination



- Banding adapters are popular too





ADSS Accessories

Connection Options, continued

Which option to use? Guidelines, in descending order of importance:

- **You must verify the hardware fits with the accessory!**
- You must verify the assembly is consistent with the orientation of the attachment point (if this gets overlooked, an anchor shackle can fix it)
- What your company already stocks
- Price and availability
- What you like

In case you are wondering: “What about cotter pin versus bolt+nut+cotter pin?” In my experience, cotter pin alone works just fine.



ADSS Accessories

AEOLIAN VIBRATION CONSIDERED

AEOLIAN VIBRATION ON ADSS WILL NOT CAUSE FATIGUE DAMAGE LIKE IT DOES WITH ALUMINUM CONDUCTORS, BUT...

- **ADSS tends to vibrate at higher levels!**
- The jacket can be damaged by wear
- Plus, the vibration will pass to the connecting hardware or structure
Can lead to wear on the hardware
- Vibration dampers are cheap insurance against problems

ADSS Accessories

Spiral Vibration Damper (SVD) – The only way to go!

✓ ● Spiral Vibration Damper (SVD)

Length



- Advantages
 - Highly effective!
 - Very economical

- Simple protection plans. Typically:
 - 2/span up to 800 ft (244 m)
 - 4/span up to 1,600 ft (488 m)
 - 6/span up to 2,400 ft (732 m)
- Easy to install
 - Also, can "nest" 2 or 3 together

- Disadvantages
 - Limited to OD's < 0.75 inches (19 mm)



ADSS Accessories

Vibration Dampers – Additional Info

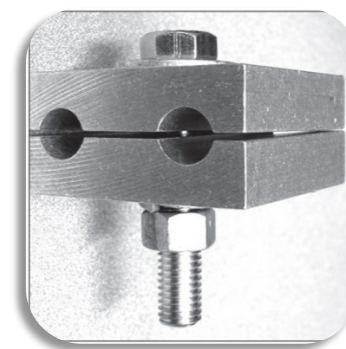
- It is best to coordinate a damper analysis and protection plan with both the cable and the damper suppliers
- Standard placement guidelines are
 - 2 each/span up to 800 ft
 - 4 each/span up to 1,600 ft
- Beware any terrain conducive to smooth laminar wind flow!
(50 – 100% more dampers!!)
 - River crossings
 - Canyon crossings
 - Very flat terrain, unbroken by trees, buildings, etc.

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Downlead Clamps (DLC's)

At splice points, DLC's are used to guide the ADSS down the structure to the splice enclosure

- Two basic types
- Plastic (typically urethane)
- Aluminum



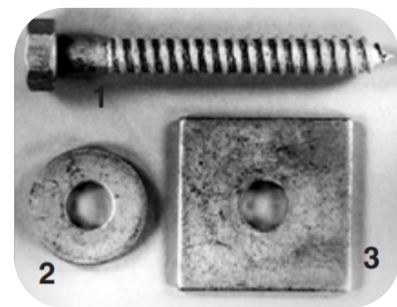
Both types work fine. I prefer the urethane ("plastic for plastic"...for OPGW, "metal for metal")

ADSS Accessories

Downlead Clamps. Mounting Options

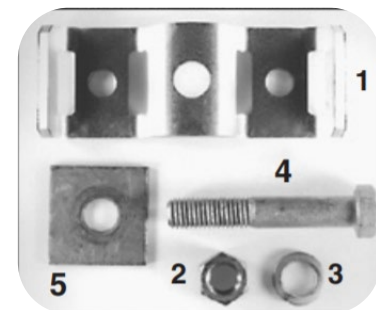
There are mounting options for all structure types

- Lag screw



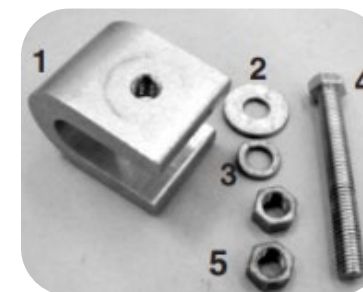
— Wood poles

- Banding adapter



— Steel poles (very common)
— Wood poles
— Concrete poles

- Lattice tower adapters. Lots of different designs



Note: You can also just use a bolt for metal and concrete poles if a nut or similar female interface is included (i.e. specified by you)

ADSS Accessories

Splice Enclosures

There are lots of splice enclosures on the market today! (Could be a separate webinar)

- Dome Types



Today's most popular type

- "Clam Shell" Types



A classic design that still works great!

- Cast Type



A very old design (late 80's), but lingers on

ADSS Accessories

Splice Enclosures – Which Type to Use

- Dome type offers the best seal → Prevents leaks!
- Cast type offer the worst seal (anecdotal evidence of lots of leaks) and are not well-suited for prepping in a controlled environment
 - Either: Mount first, but then optical core exposed during splicing
 - Or: Slice in controlled environment, but then heavy and hard to mount

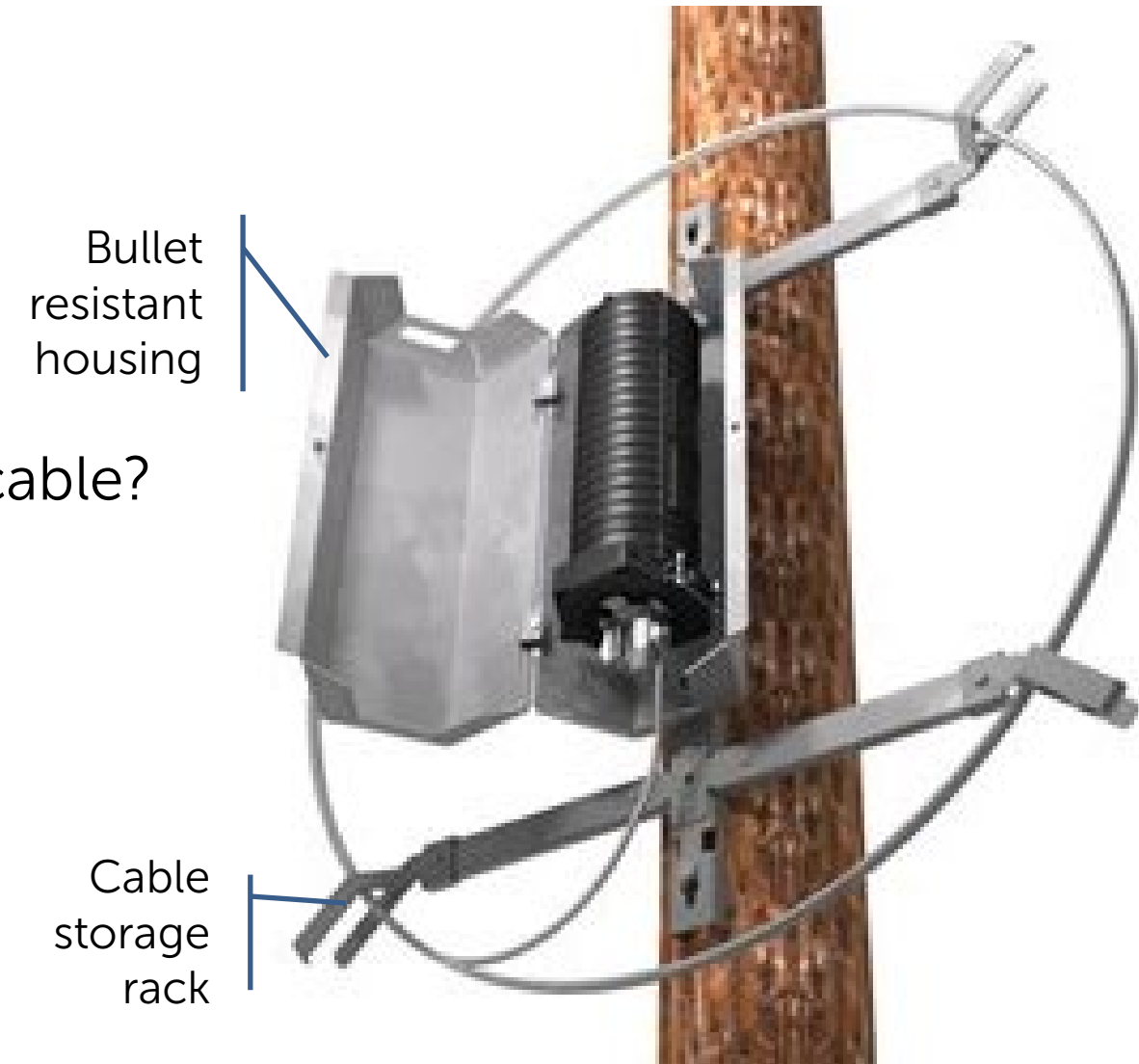
Remember: Water and fiber don't mix!

ADSS Accessories

Splice Enclosures – Other Considerations

- Splice trays
 - 24-fiber trays coordinate well with most of today's ADSS designs.
 - Use what you (or your splice techs) like
- Cable storage. Can you ever have too much spare cable?
- Bullet resistance. In areas where that's needed.

Another bullet resistant housing design →



ADSS Accessories

Other Items. “Snowshoes” for Aerial Storage

Mike’s opinion

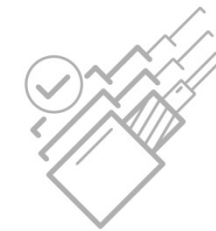
- I don’t like them. Suggest a coil storage bracket be used whenever storage is needed
- Carryover from “strand and lash” (“yesterday’s technology lingers to today”)
- Consider: Is it really a good idea to intentionally put extra load on your self-supporting cable?
 - What are the long-term effects? Anything good?



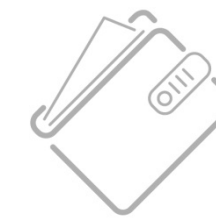
ACES: Advanced Cable Engineering System

ADSS Configurator

- Our Advanced Cable Engineering System (ACES) is a unique software tool to help engineers select the optimal ADSS design along with the associated accessories, including dead-ends, suspensions, down leads, splice enclosures, and dampers
- ACES SPOT will help to calculate space potential around overhead transmission lines with ADSS cables.
- ACES CATS will help to calculate ADSS cables sag and tension depending on span length.
- ACES ADSS will also help engineers and planners prepare cost estimates, generate a complete bill of materials, determine reel lengths, and plan logistics



optimal cable selection



cost estimates



specifications generation



design calculations

[Start ACES](#)

ACES was developed by Incab in partnership with Preformed Line Products, and we very much appreciate their assistance.



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Thank you!

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