

Chapter 5 – Site Considerations and Set-ups – Table of Contents

1. PURPOSE	1
2. SCOPE	2
3. DEFINITIONS	2
4. ASSOCIATED DOCUMENTS	2
5. SITE CONSIDERATIONS	2
5.1. Setup areas	2
5.2. Wire Pull Plan.....	3
6. SET-UPS	4
6.1. Payout Reel / Tensioner Set-up	4
6.2. Tensioner Feed Sheave	5
6.3. First Structure Sheave Set-up	6
6.4. Restricted Area Alternatives	7
6.5. Back-to-Back Reel Pulls.....	7
7. TEN INSTALLATION DON'TS	8
7.1. DON'T OVER-BEND!	8
7.2. ONE Tensioner DON'T.....	8
7.3. TWO Payout Reel DON'TS.....	8
7.4. THREE Handling and Equipment DON'TS.....	8
7.5. TWO Pulling / Stringing DON'TS	8
7.6. ONE Termination DON'T.....	8

1. PURPOSE

1.1. This is Chapter 5 of the ACCC® Conductor Installation Guidelines, covering installation site considerations and set-ups. The Guidelines consist of nine chapters, each written to stand alone to address specific installation subjects. Taken together, the nine chapters comprise the entire Installation Guidelines:

- 1.1.1. Chapter 1 — General Installation Guidelines
- 1.1.2. Chapter 2 — Safety
- 1.1.3. Chapter 3 — Training
- 1.1.4. Chapter 4 — Reel Handling and Storage
- 1.1.5. Chapter 5 — Site Considerations and Set-ups
- 1.1.6. Chapter 6 — Required Equipment
- 1.1.7. Chapter 7 — Stringing / Pulling
- 1.1.8. Chapter 8 — Sagging, Terminations, and Suspending
- 1.1.9. Chapter 9 — Maintenance and Repair

- 1.2. The purpose of the Guidelines is to provide experienced transmission engineers, project managers and planners, field inspectors, utility personnel and linemen with guidelines, recommendations and requirements necessary to safely and successfully install the ACCC® composite-core bare overhead conductor and accessories. This document is an overview and guideline covering what to do but not necessarily how to do it. It is not intended to serve as a more intensive training manual or act as a substitute for proper training, required personnel skill sets, or industry experience.

2. SCOPE

- 2.1. These guidelines apply to equipment and techniques required to successfully install all sizes of ACCC® conductor.
- 2.2. These guidelines include additional equipment and techniques that are required for Ultra-Low Sag (ULS) ACCC® conductor sizes.

3. DEFINITIONS

- 3.1. ACCC® is a registered trademark of CTC Global, and is defined as Aluminum Conductor Composite Core, stranded with Aluminum 1350-O (where O stands for fully annealed) or Aluminum 1350-O Z-wire trapezoidal wire.

4. ASSOCIATED DOCUMENTS

- 4.1. IEEE Standard 524™ Guide to the Installation of Overhead Transmission Line Conductors.
- 4.2. OSHA Electric Power Generation, Transmission, and Distribution Standards 1910.269 and 1926.950 or ISO 29.240.20 or local country equivalents.
- 4.3. The remaining Chapters of the Installation Guidelines

5. SITE CONSIDERATIONS

5.1. Setup areas

- 5.1.1. Setup areas, where conductor reel handling equipment will be placed, must allow for access for the delivery, unloading and handling of new reels of conductor, and for the loading and handling of take-up reels. Additional detail regarding storage and handling of conductor reels is found in Chapter 4.
- 5.1.2. Setup areas must allow for access by and proper placement of payout reel stands and tensioners. The tensioner should be positioned at least three (3) times the height of the first structure back from the first structure. The payout reel must be at least 50' (15 meters) away from the tensioner. See 6.1.
- 5.1.3. With proper use of sheaves, the tensioner and / or payout reel equipment may be offset to avoid obstacles or take advantage of better setup areas.

- 5.1.4. Tensioners and payout reel stands must be prevented from shifting or movement during use. In some soil conditions, this can be done with screw anchors or dug-in “dead man” anchor. In some cases, concrete weighting may be used. Often, large trucks or heavy equipment is used for anchoring.
- 5.1.5. For bundled conductor projects, conductor bundles should be pulled simultaneously. Allow for extra sets of payout reels, tensioners, and pullers at setup areas. Additional detail regarding bundled conductor considerations is found in Chapters 7 and 8.
- 5.1.6. Clearance distances from existing electric power lines shall be respected and maintained:

Voltage (nominal, kV, alternating current)	Minimum Clearance Distance (feet)	Minimum Clearance Distance (meters)
up to 50	10	3
over 50 to 200	15	5
over 200 to 350	20	6.5
over 350 to 500	25	8
over 500 to 750	35	11
over 750 to 1,000	45	14
over 1,000	*	*
* (as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).		
Note: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.		
Note: This table from OSHA 1906.1408		

- 5.1.7. Live lines nearby can induce voltage and current into the conductor, especially parallel live lines, and this is common when re-conductoring. ALWAYS follow recommended grounding procedures.

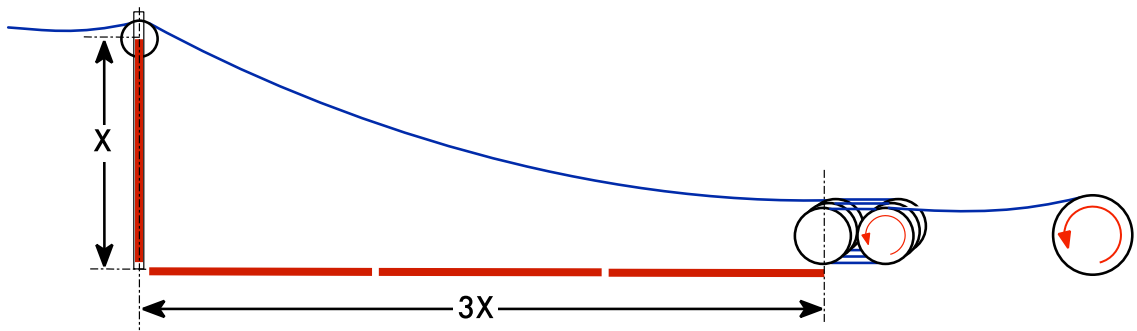
5.2. Wire Pull Plan

- 5.2.1. A project will benefit from a detailed plan for the series of pulls to install the conductor. A detailed wire pull plan can even order the correct amount of conductor on each reel.
- 5.2.2. The pulling plan should consider available setup areas, length of pulls, and should include planning of where conductor terminations and splices will be done, whether on the ground (consider ground conditions) or in the air (consider equipment and personnel access).
- 5.2.3. The pulling plan must consider clearance distances from existing electric power lines, see table above.
- 5.2.4. The pulling plan should be available before the project start and should be reviewed with the ACCC® Field Representative

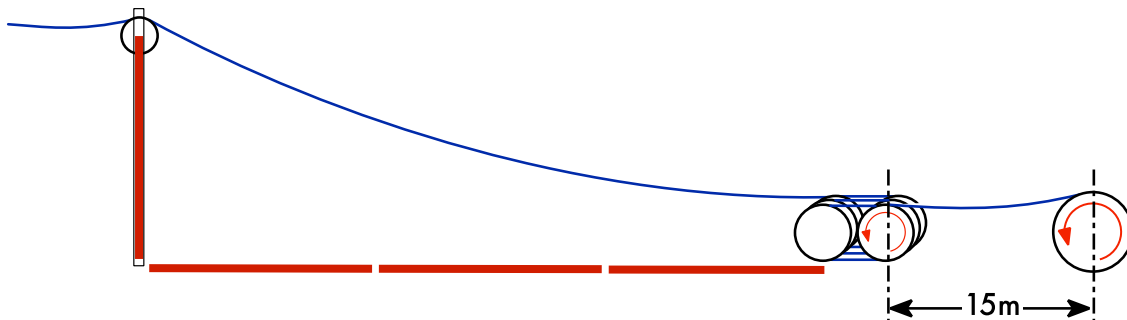
6. SET-UPS

6.1. Payout Reel / Tensioner Set-up

- 6.1.1. **Minimum Required Distance between Tensioner and First Structure:** The tensioner must be placed **three times** the height of the first structure back from the structure.



- 6.1.2. **Minimum Required Distance between Reel and Tensioner: 15 meters!**
 Loosening of the stranding that often occurs between the reel and the bullwheels of the tensioner is caused to a great extent by coil memory in the conductor. As the conductor is unwound from the reel and straightens out, the outer strands become loose, a condition that is particularly noticeable in a large diameter conductor and can be best observed at the point at which it leaves the reel. As the conductor enters the bullwheel groove, the pressure of contact tends to push the loose outer strands back toward the reel where the looseness accumulates, leading to the condition commonly known as birdcage. If this condition is not controlled, the strands can become damaged to the extent that the damaged length of conductor must be removed. This problem can be remedied by allowing enough distance between the reel and tensioner to permit the strand looseness to distribute along the intervening length of conductor and simultaneously maintaining enough back tension on the reel to stretch the core and inner strands to sufficiently tighten the outer strands.

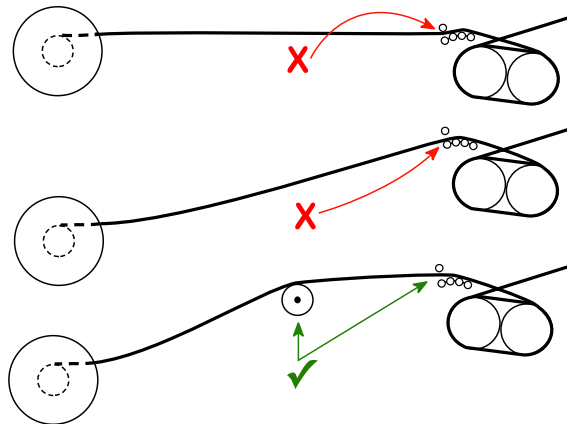


6.2. Tensioner Feed Sheave

- 6.2.1. ALWAYS install a minimum working diameter sheave between the payout reel and the tensioner. Position the sheave to guide the conductor into the CENTER of the tensioner fairlead. The purpose of the feed sheave is to prevent the conductor from bending sharply at any of the tensioner fairlead rollers, under any conditions.



- 6.2.2. The tensioner Feed Sheave shall be the same or greater diameter as the first and last structure sheaves.



- 6.2.3. The Tensioner Feed Sheave may also be used, if properly positioned and mounted, to facilitate alignment differences between payout reel, tensioner, and first structure.

- 6.2.4. For bundled applications, use individual sheaves between each payout reel and the tensioner to allow for slight differences in payout speeds or tensions and differences in payout stand placements and conductor path adjustments.



6.3. First Structure Sheave Set-up

- 6.3.1. The first structure sheave groove must always be free to align exactly with the plane of the conductor path, or the conductor will ride up out of the bottom of the sheave groove which can cause birdcage or damage the aluminum strands.
- 6.3.2. Pulling tension tends to naturally produce this alignment. However, when the angle is large, the pulling tension may be too low to produce sufficient alignment. In this case, use a rope and hoist to create the correct vertical angle of the sheave such that the conductor will ride in the bottom of the sheave groove.



- 6.3.3. Assure that contact between the sheave and the structure itself does not restrict the alignment between the sheave groove and conductor path.



6.4. Restricted Area Alternatives

- 6.4.1. The purpose of the 3:1 rule (paragraph 6.1.1) is to keep the angle of the conductor over the first sheave under about 20° and to provide sufficient length for the conductor to absorb the opening of strands that tends to occur when any helical wound conductor passes over a sheave under tension. When set-up areas are restricted and the 3:1 rule cannot be achieved, the alternatives are, in order of preference:
- 6.4.2. Use a larger sheave at the first structure.
- 6.4.3. Use a tandem sheave block at the first structure.
- 6.4.4. Reduce the height of the first structure sheave.
- 6.4.5. Move the set-up area for tensioner / payout reel to the other direction side and pull that reel in from the other direction.
- 6.4.6. Skip that set-up area: pull back-to-back reels instead (usually last choice).
- 6.4.7. The choice of alternatives is best made by experienced personnel based on site conditions. In all cases, watch for strand opening at the tensioner and each sheave. If opening is observed, reduce stringing tension if possible.

6.5. Back-to-Back Reel Pulls

- 6.5.1. Reels of ACCC conductor may be pulled back-to-back for a variety of reasons including to avoid difficult setup areas. Two reels to four reels may be pulled back-to-back, sometimes more, please check with CTC Field Service. As a guideline, pulls should not be more than 20 spans. See Chapter 7 for specific guidelines for pulling multiple reels.

7. TEN INSTALLATION DON'TS**7.1. DON'T OVER-BEND!**

7.1.1. Don't allow the conductor to contact surfaces that present sharp angles or small diameters.

7.2. ONE Tensioner DON'T

7.2.1. Don't let ACCC® run hard on the end roller of the fairlead. Always use an interim sheave to feed the conductor into the middle of the tensioner fairlead opening. A multiple-roller “banana” fairlead is highly recommended.

7.3. TWO Payout Reel DON'TS

7.3.1. Don't allow the conductor to bounce or jump up and down between the payout reel and the tensioner. When the conductor is jumping or bouncing, the core can be damaged.

7.3.2. Don't use a payout reel with insufficient brakes. Poorly maintained or undersized brakes will cause jumping and bouncing of the conductor between the payout reel and the tensioner. The payout reel brakes should allow the tensioner to draw new conductor from the reel smoothly and evenly.

7.4. THREE Handling and Equipment DON'TS

7.4.1. Don't use grips that aren't designed for installing ACCC®. Use Klein “Chicago” long jaw grips or equal, designed for the size conductor being installed. Never use pocketbook grips!

7.4.2. Don't allow the conductor tail or the deadend to fall or droop unsupported while handling the conductor. If the tail is not controlled, it will damage the core at the back of the grip.

7.4.3. Don't hoist the conductor in any manner which causes a sharp bend in the conductor.

7.5. TWO Pulling / Stringing DON'TS

7.5.1. Don't install any ACCC® with under-diameter sheaves on the first and last structure or any angles that are over 30 degrees.

7.5.2. Don't pull in conductor using old conductor if it is rusty. Don't use old conductor with splices or broken strands for pulling. Always cut splices and any damaged areas out and replace with Kellum grips before using old conductor for pulling. When in doubt, pull in a pilot line using the old conductor and pull in ACCC® using the pilot line. Always use a pilot line for long spans and river crossings.

7.6. ONE Termination DON'T

7.6.1. Don't allow a sharp bend where the conductor exits the termination hardware. Hoisting conductor or deadend without paying attention to this area can damage the core at that point.

REVISION HISTORY

REV.	CHANGE REQUEST #	DATE
A	121515-1	15 Dec 2015
B		April, 2016
C	Added Section 5.1.5 Bundled Conductors Deleted Section 6.1.2 Added Section 6.2.4 Tension Feed Sheaves for Bundled Applications Copyright 2017	July 2017