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1. PURPOSE

- 1.1. This is Chapter 2 of the ACCC® Conductor Installation Guidelines, covering safety during installation. 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 Suspensions
 - 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. It is far beyond the scope of these guidelines to present the required safety practices for working high voltage transmission lines. Some extensive and effective safety procedures

are found in the referenced documentation. CTC recommends strict adherence to a comprehensive safety program and compliance with locally applicable regulations and company policies.

- 2.2. These guidelines apply to equipment and techniques required to successfully install all sizes of ACCC[®] conductor.
- 2.3. 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

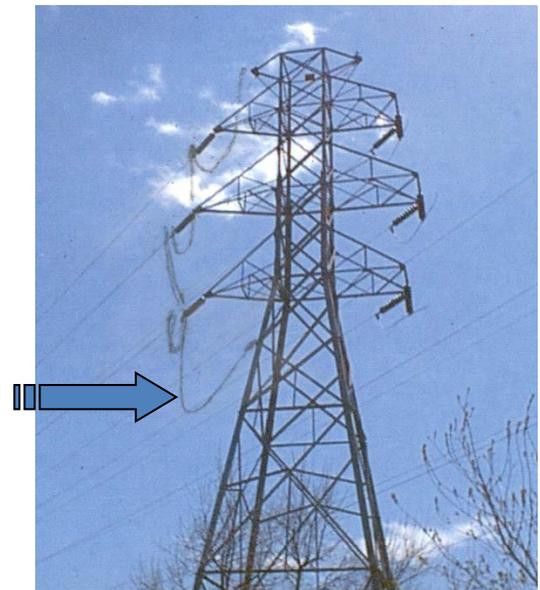
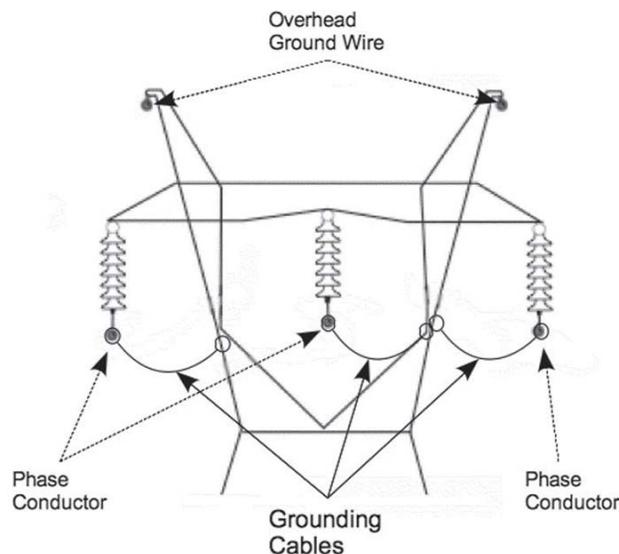
- 4.1. IEEE Standard 524[™] Guide to the Installation of Overhead Transmission Line Conductors or IEC or other governing body equivalent.
- 4.2. OSHA Electric Power Generation, Transmission, and Distribution Standards 1910.269 and 1926.950 or ISO 29.240.20 or local country equivalents.
- 4.3. The remaining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

5. ACCC[®] UNIQUE SAFETY CONSIDERATIONS

- 5.1. ACCC[®] bare core, and to a lesser extent ACCC[®] conductor, presents a striking hazard if the conductor is bent and then suddenly released.
- 5.2. The carbon fiber composite core is sheathed in a fiberglass layer. Tiny glass slivers are produced when the core is cut or broken. Always wear leather work gloves and safety glasses when cutting or working with the end of ACCC[®] conductor or core.
- 5.3. The carbon and glass fibers that comprise the composite core have diameters that range from 7 to 25 microns, and these fibers are embedded in a thermoset resin. Nanotubes or nanofillers that have diameters in the nanometer range, are not used in the composite core. When cutting the composite core during installation, the size of the dust particles will be governed by the cutting device used; a hack saw will generate relatively large dust particles compared to the diameters of the fibers that make up the core. No nano-dust that might represent a short-term breathing hazard is created when cutting or sanding down the core. The dust that is created consists of carbon and glass fibers; only long term exposure to excessive quantities of dust (more than 100 times the amount of dust from installation cutting/sanding) may result in detrimental health effects.
- 5.4. A Material Safety Data Sheet (MSDS) for ACCC[®] composite core is found in Appendix A.

6. GROUNDING

- 6.1. Disclaimer: Although the wording and pictures below are industry standards, it is always the responsibility of the employer to create their own grounding program to protect their employees and equipment.
- 6.2. CTC recommends equal potential grounding practices per OSHA 1910.269 or local equivalent.
- 6.3. Grounds shall be sized to interrupt the maximum fault current that could be seen on the installed conductor. Ground clamps with smooth inside surfaces are preferred to avoid damage to the annealed aluminum. Serrated surface ground clamps may be used if indentations are not created in the aluminum conductor wire surfaces.
- 6.4. During installation, grounds must be placed on ACCC® conductors, just as they would be utilized on other transmission and distribution conductors. **CONDUCTOR GROUNDS MUST BE PLACED DIRECTLY ON THE ALUMINUM STRANDS.** The composite core is non-conductive.
- 6.5. Rolling Grounds should be in good condition, make good contact, and roll smoothly, reference OSHA 1926.950. Rolling grounds should be used in addition to grounding mats and **NOT IN PLACE** of equal potential grounding practices. Rolling grounds should be placed in front of the puller and tensioner, not between the payout reel and tensioner.
- 6.6. De-energizing circuits, grounding including equal-potential grounding shall comply with OSHA 1926.961, OSHA 1926.962, OSHA 1910.269 and/or country specific safety requirements relating to de-energizing and grounding transmission and distribution lines.



- 6.7. Protecting workers on the ground. The employer may use several methods, including equal potential zones, insulating equipment, and restricted work areas, to protect employees on the ground from hazardous differences in electrical potential.
- 6.8. An equal potential zone will protect workers within it from hazardous step and touch potentials. Equal potential zones will not, however, protect employees located either wholly or partially outside the protected area. The employer can establish an equal potential zone for workers on the ground, with respect to a grounded object, through the use of a metal mats connected to the grounded object. The employer can use a grounding grid to equalize the voltage within the grid or bond conductive objects and between the objects and between object and ground. (Bonding an object outside the work area can increase the touch potential to that object, however.)



- 6.8.1. Insulating equipment, such as rubber gloves, can protect employees handling grounded equipment and conductors from hazardous touch potentials. The insulating equipment must be rated for the highest voltage that can be impressed on the grounded objects under fault conditions (rather than for the full system voltage.)
 - 6.8.2. Employees should be restricted from any step or touch potential not involved in the stringing, deadending, or clipping processes. The employer must ensure that employees on the ground in the vicinity of transmission structures are at a distance where step voltages would be insufficient to cause injury. Employees must not handle grounded conductors or equipment likely to become energized to hazardous voltages unless the employees are within an equal potential zone or protected by insulating equipment.
- 6.9. 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.
 - 6.10. Grounds shall never be removed without approval from the designated individual holding the line clearance.

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.

Appendix A — MSDS



F-824-006-E

ACCC Safety Data Sheet

SDS NO. 061306001

Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standards, 29 CFR 1910, 1200, Standard must be consulted for specific requirements.

IDENTITY (As Used on Label and List) ACCC Cable Core		Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked as indicated that.	
Section I			
Manufacture's Name CTC Global Corporation		Emergency Telephone Number Infotrac 800-535-5053	
Address (Number, Street, City, State, and Zip Code) 2026 McGaw Ave Irvine, CA 92714		Telephone Number for Information 949-428-8500	
		Date Prepared 08/18/14	
		Signature of Preparer (optional)	
Section II – Hazardous Ingredients/Identity Information			
Hazardous Components (Specific Chemical; Common name(s))			
None			
OSHA PEL	ACGIH TLV	Other Limits Recommended	% (Optional)
N/E	N/E	N/E	N/E
None Established—N/E			
Section III – Physical/Chemical Characteristics			
Boiling Point N/A		Specific Gravity (H ₂ O = 1) 2.03 g/cc	
Vapor Pressure (mm Hg.) N/A		Melting Point N/A	
Vapor Density (AR = 1) N/A		Evaporation Rate (Butyl Acetate = 1) N/A	
Solubility in Water <0.1%			
Appearance and Odor Tan/Brown solid rod			
Section IV – Fire and Exposition Hazard Area			
Flash Point (Method Used) > 300 deg C / 570 deg F Estimated	Flammable Limits Not Established	LFL NE	UFL NE
Extinguishing Media Water, Foam, CO ₂ , Dry Chem.			
Special Fire Fighting Procedures Use self contained breathing apparatus			
Unusual Fire and Explosion Hazards Combustion product may be toxic. Note: Cable on reel under high tension. Fire may burn through cable releasing tension violently.			
Section V – Reactivity Data			
Stability	Unstable Stable X	Conditions to Avoid NONE	
Incompatibility (Materials to Avoid) None known			

<p>Hazardous Decomposition or Byproducts Combustion may form toxic materials such as carbon dioxide, carbon monoxide and airborne particulates.</p>			
Hazardous Polymerization	May Occur		Conditions to Avoid Extreme heat > 260 deg. C / 500 deg. F
	Will Not Occur	X	
<p>Section VI – Health Hazard Data</p>			
Route(s) of Entry:		Inhalation?	Skin?
		X	X
Ingestion? N/A			
<p>Health Hazards (<i>Acute and Chronic</i>) Dust particles associated with cutting, grinding or burning may cause irritation of the skin, eyes, and respiratory tract.</p>			
Carcinogenicity:		NTP?	IARC Monographs?
NO		NO	NO
<p>OSHA Regulated? NO</p>			
<p>Signs and Symptoms of Exposure With exposure to machined dust – itchy skin, possible rash, itchy eyes and/or respiratory irritation.</p>			
<p>Medical Conditions with exposure to machined dust Skin, eye, and respiratory ailments</p>			
<p>Emergency and First Aid Procedures Skin contact: Wash with soap and water. Eye contact: Irrigate to remove particles. Inhalation: Move to fresh air, treat irritation symptomatically contact a physician.</p>			
<p>Section VII – Precautions for Safe Handling and Use</p>			
<p>Steps to Be Taken in Case Material is Released or Spilled Dust should be collected in a manner not likely to create airborne particles. Vacuuming with a HEPA filtered vacuum is the preferred method; but if that can not be done carefully sweep up the particles.</p>			
<p>Use NIOSH or equivalent international standard approved respirator mask.</p>			
<p>Waste Disposal Method ACCC Core and residue from machining are not listed as hazardous waste, nor do they exhibit any of the hazardous characteristics contained in federal hazardous regulations (40 CFR 261). Waste ACCC Core should be disposed of in an approved landfill in accordance with existing national and any local regulations.</p>			
<p>Precautions to be Taken in Handling and Storing Cable Core is stable for storage. Care should be taken when unwinding due to potential energy contained in wound product.</p>			
<p>Section VIII – Control Measures</p>			
<p>Respiratory Protection (<i>Specify Type</i>) NIOSH approved respirator for dust from cutting or grinding.</p>			
Ventilation	Local Exhaust	Adequate ventilation should be provided whenever dust is generated.	Special N/A
	Mechanical (<i>General</i>)	N/A	Other N/A
Protective Gloves Leather or latex when cutting or grinding		Eye Protection Safety glasses	
<p>Other Protective Clothing or Equipment Hard hats, long sleeves and pants must be worn when releasing or securing core material.</p>			
<p>Work/Hygienic Practices Wash exposed skin with soap and water immediately after exposure to dust from cutting.</p>			

REVISION HISTORY

REV.	CHANGE REQUEST #	DATE
A	121515-1	15 Dec 2015
B	Changed copyright footer to 2017	7 July 2017