



CITY OF AUSTIN - AUSTIN ENERGY (AE)

PURCHASE SPECIFICATION

FOR

COVERED CONDUCTOR, ACSR,1/0-795KCMIL,15KV, XL-HDPE

DATE	PREPARED BY	CHANGE SUMMARY	APPROVAL
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1. Scope & Classification

This specification covers a conductor being “covered” with insulating materials. The covered conductor is a generic name for many sub-categories of this conductor design commonly referenced as tree wire, spacer cable, aerial bundle, or Standards Department equivalent. A covered conductor must include a layer(s) of insulating material polyethylene and provide resistance/elimination of tracking caused by tree, animal, or conductor contact.

Manufacturer user list / Years of Experience

- Hendrix/5+
- Southwire/ 5+

2. Definitions and Terminology

- **Conductor Shield** – Semiconducting cross-linked polymer that reduces stress concentrations caused by individual conductor (ACSR) strands
- **Inner Layer** – Low-density crosslinked polyethylene
- **Outer Layer** – High-density cross-linked polyethylene
- **Primary**- Overhead distribution conductor
- **Sunlight (UV) Resistance** - UV testing will involve inducing property changes associated with the effects of sunlight, moisture, and heat.
- **Stress-Crack** –An external or internal rupture in a plastic caused by tensile stresses less than its short-time mechanical strength
- **Electrical Erosion** –The progressive wearing away of electrical insulation by the action of electrical discharges
- **Track** –A partially conducting path of localized deterioration on the surface of an insulating material
- **Tracking** –The process that produces tracks as a result of the action of electrical discharges on or close to the insulation surface
- **Tracking Resistance** –A quantitative expression of the voltage and the time required to develop a track under specified conditions
- **Dielectric Constant**- A quantity measuring the ability of a substance to store electrical energy in an electric field
- **Dielectric Strength**- The maximum electric field that a pure material can withstand under ideal conditions without breaking down

3. Applicable Standards

- ASTM B230 Aluminum, 1350-H19 Wire for Electrical Purposes
- ASTM B231 Concentric-Lay-Stranded Aluminum 1350 Conductors or ASTM B232 Concentric-Lay-Stranded, Aluminum Conductors, Coated Steel Reinforced (ACSR)
- ASTM B498 Zinc-Coated (Galvanized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR) or ASTM B500 Metallic Coated Stranded Steel Core for use in overhead Electrical Conductors
- ICEA S-121-733 Tree Wire and Messenger-Supported Spacer Cable

4. Functional Requirements

- Conductor Properties
 - i. Cables are manufactured, tested, and marked to meet or exceed the requirements in ICEA S-121-733 for tree wire and messenger supported
 - ii. Sealed conductors that are intended to prevent longitudinal water propagation and are further covered/insulated are also permitted within the guidelines of ASTM B231 and B232.
 - iii. spacer cable suitable for installation and use in systems rated 15 kV
 - iv. Two temperature rating options are allowed:
 - 1. Normal Operation: 75°C Emergency Operation: 105°C Short Circuit Operation: 150°C
 - 2. Normal Operation: 90°C Emergency Operation: 130°C Short Circuit Operation: 250°C
 - v. Electrical Withstand - with BIL of 200 kV
- Conductor Covering Properties
 - i. Provides some resistance to outages caused by tree and wildlife contact
 - ii. Insulating Layer Contributes to the high impulse strength of the covering, which will protect the conductor from phase-to-phase and phase-to-ground contact
 - iii. Conductor Covering must complete extensive qualification testing to industry standards (UV Resistance, Environmental Cracking, and Track Resistance)
 - 1. The covering is considered sunlight resistant if the original to aged tensile and elongation ratio of 80% or greater after 720 hours of exposure.
 - 2. The coverings track resistance must meet or exceed ICEA S-121-733-2016 standard, the time to track one inch at 2.5 kV must be a minimum of 1000 minutes.
 - 3. A 90°C Rated covered conductor means that the covering will be inherently resistant to cracking under conditions of stress and in the presence of contaminants
 - 4. The covered conductor for 75°C rated may, under certain conditions of stress with the presence of contaminants, develop cracks in the material due to low tensile stress.
 - 5. Abrasion and Impact Resistant
- Covered Conductor Design
 - i. Covered insulation must have triple sheathed covered conductor design, (See Figure 2) which includes:
 - 1. The conductor must be made of aluminum conductor steel-reinforced (ACSR) or hard-drawn copper (HDCU)
 - 2. The conductor shield must be made of semiconducting thermoset polymer
 - 3. Inner layer must be made of crosslinked low-density polyethylene
 - 4. Outer layer must be made of crosslinked high-density polyethylene

5. Physical Requirements

- Conductor Material (See Figure 2)
 - i. Aluminum high-capacity, high-strength stranded Conductor. Aluminum outer strands are high-purity, meet or exceed 1350-H19 standards, and the center strand of steel that is galvanized or coated with another material to prevent corrosion that meets or exceeds ASTM B498 or B500.
 - ii. The aluminum wire must be made from hard drawing stock class AA and shall be free of brittleness as evidenced by its ability to be coiled or looped around its own diameter with or without a mandrel in accordance with ASTM specification B230, B232, B498 & B500
- Conductor Lay
 - i. Lay of the conductor strands is to be manufactured with the inner conductor layer with a right-hand lay
- Insulator Lay
 - i. Covered insulation must have a triple-sheathed covered conductor design. Three Layers (See Figure 1). The innermost layer next to the conductor (Layer A) is to be a Conductor Shield (Semiconducting layer and Reduces Voltage Stress). The middle layer (Layer B) is to be a Polyethylene Layer (Insulating Layer and may be crosslinked (XLPE)). The outermost layer (Layer C) is also Polyethylene Layer.
 - ii. The outermost insulating layer must be a solid color of grey only, must be high-density and/or crosslinked, track-resistant, and of low carbon polyethylene polymeric insulator.
 - 1. Two temperature rating options are allowed:
 - a. 3 Layer 75°C Rated: 15 mils conductor shield, 75 mils LDPE Inner Layer and 75 mils HDPE Outer Layer
 - b. 3 Layer 90°C Rated 15 mils conductor shield, 75 mils XL-LDPE Inner Layer 75 mils XL-HDPE Outer Layer
- Conductor Sizing
 - i. For 1/0 AWG (Code name Raven) must have an overall diameter of 0.728 inches
 - ii. For 336.4 kcmil (Code name Merlin) must have an overall diameter of 1.014 inches
 - iii. For 795 kcmil (Code name Kingbird) must have an overall diameter of 1.308 inches

6. Testing & Inspection

Provide the following test:

- UV Testing conformance to ICEA S-121-733-2016 Sunlight Resistance (UV) Testing (The covering is considered sunlight resistant if the original to aged tensile and elongation ratio 80% or greater after the 720 hours of exposure)
- Environmental Stress-Cracking is the development of cracks in the material due to low tensile stress and environmental conditions. Under certain conditions of stress with the presence of contaminants like soaps, wetting agents, oils, and detergents, ethylene material may exhibit mechanical failure by cracking
- Track Resistance conformance to ICEA S-121-733-2016 Track Resistant Testing (the time to track one inch at 2.5 kV must be a minimum of 1000 minutes)

- Maximum dielectric constant must be 3.5, per ICEA standards
- Manufacturers perform routine production testing to meet industry standards and are high quality

7. Training & Reliability

- The manufacturer shall provide a free training on the operation & maintenance of the product(s) new to Austin Energy.
- The manufacturer shall provide a current user list of the customer's address, name(s), and telephone number.
- If any defect in the equipment supplied, or failure to comply with this specification, shall appear within the period of 18 months from the date of final acceptance of the equipment, the Vendor shall be notified. The Vendor shall thereupon correct without delay and at Vendor's own expense, the defect or failure of compliance, by repairing the defective part or parts, by supplying a non-defective replacement or replacements, and/or by correcting a deficient design as required. The Vendor shall further replace or repair all other similar equipment if such defect may reasonably be expected to develop or occur in said similar equipment. Removal and installation cost of the defective parts or equipment shall be at the Vendors expense. In the event the Vendor shall correct any defects or failure of compliance by repair, replacement, or correction as required above, then with respect to the equipment corrected, the aforesaid warranty period shall begin from the date of completion of the installation of such correction and acceptable therefore, provide same is not unreasonably delayed by AE. This specification, until rescinded, shall apply to each future purchase and contract for the commodity described herein. Retain for future reference.

8. Shipping

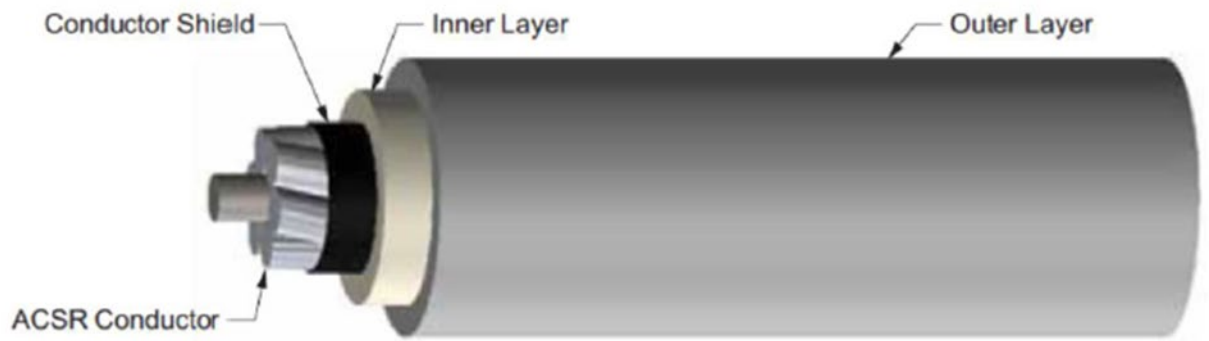
- Purchase footage shall be +/- 10%. 3-1/16 inch arbor hole -0IN, +1/4IN. This dimension must be maintained even with the use of the pressed-in metal hub "non-returnable wood reels"

9. Attachments

Figure 1



Figure 2



Wire Size Chart

Copper Covered Conductor						
Conductor Size	Conductor Type (Stranding)	Cover Type	Weight (lb/ft)	Overall Diameter (in)	Ampacity per Conductor/ (Amps)	
#2	HDCU (7)	XL-HDPE (165 mils)	0.316	0.622	240	
2/0	HDCU (7)	XL-HDPE (165 mils)	0.569	0.744	367	
4/0	HDCU (7)	XL-HDPE (165 mils)	0.845	0.852	488	
ACSR Covered Conductor						
Conductor Size	Conductor Type (Stranding)	Cover Type	Weight (lb/ft)	Overall Diameter (in)	Ampacity per Conductor/ (Amps)	
1/0	ACSR (6x1)	XL-HDPE (165 mils)	0.277	0.728	271	
336.4	ACSR (18x1)	XL-HDPE (165 mils)	0.564	1.014	550	
795.0	ACSR (26x7)	XL-HDPE	1.455	1.308	938	