



Equipment Specification

Document No.: 4350.050

Originating Department: Distribution Engineering

15 kV Primary Copper Power Cable, Copper Tape Shield



1. Introduction

This is a general specification that covers the minimum requirements for primary copper power cable, 15 kV shielded tree retardant cross linked (TRXLPE) insulation polyethylene (LLDPE) jacketed to be used in the underground distribution system in Puerto Rico. Further information will be provided by LUMA Energy at the time of order placement and will provide information on site specific conditions, quantity, and other requirements. This document includes the general electrical and mechanical characteristics of the material.

2. Special Requirements

- 2.1. Samples shall be furnished as requested by LUMA Energy. All documented testing required by applicable specifications and standards shall be submitted with product samples, including mechanical drawings, prior to approval. Vendors that have supplied this material to PREPA/LUMA on previous orders, will not have to furnish samples at bid opening. With the exception if any material or design changes were made to an approved product, vendor must re-submit sample to the Material Specification engineer for approval before shipping. The material will be received at the LUMA's general warehouse (011) at Palo Seco, Puerto Rico. Shipping will include transportation and unloading at the indicated warehouse.
- 2.2. Product shall be manufacture in accordance with the latest issue ASTM, NEMA, IEEE and ANSI specification. When conflicts occur between Purchaser's specifications and the ASTM, NEMA, IEEE, or ANSI specifications, the Purchaser's specification shall prevail. The product shall be furnished as described here in this specification or as amended by the purchase order. Any changes or updates to the Supplier's procedures, quality routines, and/or inspection layout shall be liable for all costs incurred for product that is refused/rejected.
- 2.3. Upon inspection of incoming material, the purchaser reserves the right to refuse product shipments and to determine the acceptability or rejection of product received. The Supplier shall be liable for all costs incurred for product that is refused/rejected.
- 2.4. Vendor shall submit two (2) quotes: one for conductor on steel reel and another for conductor on wood reel. See detail of reels in section 6.



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3. Quantity/Literature

Descriptive and technical literature must be supplied by vendor at time of bidding. This literature may include, but is not limited to details of material, drawings, documented testing, and instructions for use and installation. Failure to submit documents on time will cause bidder disqualification. For products described in this specification as requiring qualification, awards will be made only for such products that, prior to the time for opening of bids, had been tested and/or approved by LUMA. Evidence of PREPA's and/or LUMA Energy's approval of the equipment or material shall be supplied by vendor if requested by LUMA Energy.

4. Markings

- 4.1. Cable reels shall be marked outside with LUMA Energy's purchase order, item number, description of cable & specification date, name, net length (including beginning and ending sequential footage marks (SFM)) & size, gross & tare weights, manufacturer's name, & lot/production number.
- 4.2. Packaging labels and tags shall be waterproof.

5. Equal or Approved Equal to

- 5.1. American Wire Group (see section 12 table 2).
- 5.2. Southwire (see section 12 table 2).

6. Packaging

- 6.1. All material and equipment shall be packaged and marked in such a way as to facilitate handling and protection from damage and that the receiving warehouse can readily identify it and send it, in one complete unit, to a field location without opening crates or boxes to sort items and/or parts.
- 6.2. The 15 kV primary cable shall be shipped continuous in a non-returnable reel, containing approximately 1,100 ft. (335.28 m.) plus or minus 5% of material. Cable won't be accepted by sections.
- 6.3. Reels shall be made of steel with a finishing consisting of a high-pressure hot phosphate wash and bonding agent, zinc chromate-iron oxide primer and final enamel coat to provide the necessary extra durability.
- 6.4. Reels made of treated wood conforming with AWPA (U1 & T1-17), with a retention of 0.3 lbs/cu ft (4.81 kg/cu m) of pentachlorophenol or chromated-copper-arsenate (CCA) shall be accepted. Treatment material shall comply with AWPA P9.



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- 6.5. Reels shall have a minimum arbor hole diameter of 2.5 in (6.35 cm).
- 6.6. Each end of the cable shall be firmly and properly secured to reel.
- 6.7. Reels shall be protected against damage in ordinary handling and shipping.
 - a. Manufacturer shall protect the upper layers with pieces of wood along the transverse section of reel for cable protection with NEMA level 2 wrapping of protective material.
 - b. Manufacturer shall protect cable ends from water entrance or damage by means of an adequate seal.
- 6.8. Other types of reels will be evaluated by Luma Energy.

7. Number Per Package (Logistics)

Approximately 1,100 ft (335.28 m) \pm 5% of conductor per reel or as requested by LUMA.

8. Acceptance Criteria

- 8.1. Test required: certified by external laboratories.
- 8.2. Latest applicable codes, standards, and other regulations: National Electrical Code (NEC), ASTM (B3, B8), NEMA WC-74, AEIC (CS5-94, CS8), and UL 1072. This product requires qualification or pre-approval by PREPA/LUMA energy.
- 8.3. NEMA Standard Publication No. WC 26: Binational Wire and Cable Packaging Standard.

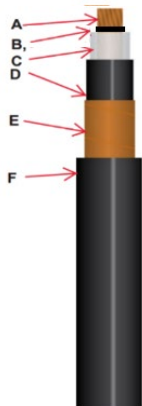
9. Description

- 9.1. This 15 kV grounded neutral cable with copper tape shield is for underground electric distribution, 13.2 kV phase to phase nominal voltage power system.
- 9.2. 15 kV shielded, in accordance with UL 1072, tree retardant cross-linked polyethylene (TRXLPE) insulation LLDPE jacketed copper power cable consisting of one (1) stranded filled uncoated compressed conductor as per ASTM B3 and ASTM B8, annealed copper wire covered with an extruded semi-conducting composed shield.
- 9.3. Shield thickness as per table D1 of AEIC standard no. CS5, with a maximum volume resistivity of 1,000 ohm-mt. It shall be free of any voids larger than three (3) mils at the insulation interface and shall have an operating temperature equal to that of the insulation.
- 9.4. The insulation material shall be tree retardant cross-linked polyethylene (TRXLPE) 100% insulation level in accordance with AEIC CS5-94 and NEMA WC-74.

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- 9.5. The insulation of the completed cable shall be free of any void larger than three (3) mils (0.003"). The number of voids larger than two (2) mils (0.002") shall not exceed 30 per cubic inch of insulation.
- 9.6. Over the insulation shall be applied an extruded semiconducting thermosetting compound compatible with the insulation. It shall comply with the requirements of AEIC CS8 standard. It shall be properly identified as semiconducting.
- 9.7. A non-magnetic metal component consisting of tape shall be applied over the extruded non-metallic covering. Metal component shall be bare copper. The tape shall be helically applied with a minimum of 12.5 % overlap and five (5) mils (0.005") thickness.
- 9.8. Cable shall be constructed with an overall encapsulating low linear density polyethylene (LLDPE) jacket.
- 9.9. Outside cable jacket shall indicate sequential footage marks (SFM).
- 9.10. Dry-curing method and triple head extrusion shall be employed for the three layers.
- 9.11. Cable must withstand a maximum operating temperature of 90° C during normal operation and must be suitable for use in wet or dry locations.
- 9.12. General cable characteristics:
- a. Conductive strand shielding: 0.012" (0.30 mm), 12 mils minimum.
 - b. Insulation thickness: 0.175" (4.44 mm), 175 mils.
 - c. Insulation shield thickness: 0.030" (0.76 mm), 30 mils minimum.
 - d. Copper tape shield thickness: 0.005" (0.13 mm), 5 mils.
 - e. Jacket thickness (LLDPE): 0.080" (2.03 mm), 80 mils minimum.

9.13. Construction:



- a. Class B compressed concentric lay, filled stranded copper conductor, preventing the ingress of humidity, moisture.
- b. Conductor shield is an extruded semi-conducting thermosetting polymeric stress control layer.
- c. Insulation is extruded, Tree Retardant Cross-linked Polyethylene (TRXLPE), 100 % Insulation Level.
- d. Insulation shield is an extruded semi-conducting thermosetting layer, clean and free stripping from insulation.



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- e. Metallic bare copper tape shield is flat uncoated 5-mil-thick, helically applied with minimum 12.5% minimum Overlap.
- f. Jacket is sunlight and moisture resistant black, non-conducting low-linear density polyethylene (LLDPE).

9.14. Table 1: Characteristics by cable sizes:

Item	Size	Stranding / Diameter	Approximate Diameter Over Insulation	Approximate Diameter Overall	Net Weight lbs/kft
1	2 AWG	7 / 0.283" (7.19 mm)	0.693" (17.60 mm)	0.963" (24.46 mm)	549 (249 kg)
2	2/0 AWG	19 / 0.406" (10.32 mm)	0.816" (20.73 mm)	1.090" (27.69 mm)	814 (369 kg)
3	4/0 AWG	19 / 0.512" (13.00 mm)	0.922" (23.42 mm)	1.195" (30.35 mm)	1113 (503 kg)
4	500 MCM	37 / 0.789" (20.04 mm)	1.209" (30.71 mm)	1.500" (38.10 mm)	2184 (991 kg)
5	750 MCM	61 / 0.968" (24.59 mm)	1.400" (35.56 mm)	1.690" (42.93 mm)	3062 (1389 kg)

10. Inspection

The acceptance of any material or equipment shall in no way relieve the vendor from his responsibility to meet all the requirements of this specification, and it would not prevent subsequent rejection if such materials were found later to be defective.

11. Warranty

The conductor shall be designed and manufactured to provide a minimum life expectancy of 40 years. Replacement costs associated with premature conductor failure due to inadequate design of faulty manufacturing is to be the responsibility of the Supplier. The manufacturer shall guarantee that each part of the finished conductor has been manufactured in accordance with requirements of the referenced specifications and standards and that the finished conductor complies with the same requirements. The supplier/manufacturer shall agree to replace any length of conductor for two years after date of delivery if defective material or workmanship is found during installation or if the conductor fails from normal use during its first year of service. In either case, the supplier/manufacture shall be given a reasonable opportunity to inspect such defect or failure. A technical report detailing the cause(s) of the defect and the corrective measures implemented to prevent recurrence shall be provided upon request of the purchaser.



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12. Table 2: Warehouse and Asset Suite Identification Number

Item	Size	Warehouse #	Asset Suite #	AWG Model	Southwire Model
1	2 AWG	006-00783	56890	2- 01MV15GT90J	SPEC 46306
2	2/0 AWG	006-00767	56889	2/0- 01MV15GT90J	SPEC 46306
3	4/0 AWG	006-01005	56896	4/0- 01MV15GT90J	SPEC 46306
4	500 MCM	006-00866	56893	500- 01MV15GT90J	SPEC 46306
5	750 MCM	006-00874	56894	750-01MV15GT90J	SPEC 46306

— End of Specification —

Document History

Version

Item	Version
006-00783	11
006-00767	10
006-01005	11
006-00866	13
006-00874	12

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